



Science and Technology for Chem-Bio Information Systems (S&T CBIS)
"Translating Lessons Learned into Systems Requirements"

25 -28 October 2005

Agenda

Tuesday, 26 October 2005 - General Session

Keynotes:

- Systems Perspective on Information Systems, BG Stephen V. Reeves, USA, Joint Program Executive Officer for Chemical Biological Defense
- Chemical and Biological Technology for the Joint Warfighter, COL Benjamin Hagar, Joint Science & Technology Office, CBDP, and Chemical and Biological Technologies Directorate, Defense Threat Reduction Agency
- Joint Requirements Office for Chemical, Biological, Radiological, and Nuclear Defense (JRO for CBRND), LTC Mark Bohannon, VC, USA

Technology Transition Overview - How do I get the Cheese?, Mr. Curt Wilhide, Chief, Advanced Technology and Transition

Joint Project Manager Information Systems Program Overview, CAPT Tom O'Keefe, USN, JPM Information Systems, Joint Program Executive Office for Chemical and Biological Defense

Joint Effects Model Program Overview, Mr. Tom Smith, JEM Acquisition Program Manager

Joint Operational Effects Federation Program Overview, Dr. Jerry Hoffman, JOEF Acquisition Program Manager

Joint Warning and Reporting Network Program Overview, Mr. Chuck Walker, JWARN Acquisition Program Manager, Joint Project Manager Information Systems

Joint Project Manager Information Systems Integration Overview, Mr. Kevin Adams, JPM IS Lead Integrator, SSA Director

Joint Science and Technology Office Program Overview, Mr. Chuck Fromer, Joint Science and Technology Office for Chemical and Biological Defense (JSTO-CBD)

Environmental Hazard Prediction Thrust Area Overview, Mr. John Pace, Joint Science and Technology Office, Defense Threat Reduction Agency

Operations Effects Thrust Area Overview, Mr. Mark Fagan, OETA Manager

Battlespace Management Thrust Area Overview, Mr. William J. Ginley, Battlespace Management Thrust Area Manager, Edgewood Chemical Biological Center

Wednesday, 27 October 2005 - General Session

Agent Fate Program Overview, Dr. James Savage, Research Development and Engineering Command, ECBC

CBDP Decision Support Tools and Methodologies, Mr. Scott Cahoon, Defense Threat Reduction Agency

BREAKOUT SESSION A

Working Group I - Dispersion Modeling and Sensor Data Fusion:

Session A-I Agenda

- Overview of Hazard Prediction Modeling Program, Mr. John Pace, Joint Science and Technology Office, Defense Threat Reduction Agency
- RCB Weapon Environment Prediction: Source Term Estimation, Mr. Paul Thomas, Mr. Peter Robins, and Ronni Rapley
- High Level Architecture Compliance: Source Term Estimation Demo, Mr. Ian Griffiths, Mr. Andrew Solman, and Mr. Ben Swindlehurst
- STEM II Bio Data (Video)
- Mobil Array (Video)

Working Group II - Chemical Agent Persistence and Prediction Modeling:

Session A-II Agenda

- Droplet Reaction and Evaporation of Agents Model (DREAM), Mr. A.R.T. Hin, TNO, The Netherlands
- Chemical Agent Fate Program (CAFP): Development of an Evaporation Model for HD on Non-Porous Surfaces, Mr. Brad Dooley, California Institute of Technology and H. K. Navaz, Kettering University
 - Sample Animated Droplet Topology - 1 L Droplets (*Video*)
 - Sample Animated Droplet Topology - 6 L Droplets (*Video*)
 - Sample Animated Droplet Topology - 9 L Droplets (*Video*)
- Applying Quantum Chemical Theory to the Fate of Chemical Warfare Agents, Dr. Tom J. Evans and Dr. Tom Stark, Cubic Applications, Inc.

Working Group III - Battlespace Management:

Session A-III Agenda

- CB Defense Battle Management, Mr. William J. Ginley, Battlespace Management Thrust Area Manager, Edgewood Chemical Biological Center
- Next Generation Chem Bio Battle Management System, Mr. Jim Reilly, AFRL/IFSA

Working Group IV - Decision Making and Support:

Session A-IV Agenda

- Analytical Capabilities Development, Dr. Jeffrey Grotte, Institute for Defense Analyses
- Virtual Prototyping Feasibility/Benefit and CB Common Knowledge Base BA05MSB061, Mr. Michael Kierzewski, ECB, and Mr. Scott Kothenbeutel, Battelle
- DTRA -Modeling and Simulation/Battlespace - BO05MSB070: Multivariate Decision Support Tool for CB Defense, Dr. Frank Gilfeather, UNM

Working Group V - Special Topics: Test and Evaluation:

Session A-V Agenda

- Warning, the Critical Element to Mitigate the Effects of a CBRN Attack, Dr. Alan Avidan MadahCom, Inc.
- Sensor Placement Optimization, Mr. Keith Gardner, Northrop Grumman IT

BREAKOUT SESSION B

Working Group I - Dispersion Modeling and Sensor Data Fusion:

Session B-I Agenda

- Fusion of Sensor and Model Data, Dr. Deborah Fish, Mr. Oliver Lanning and Mr. Paul Thomas
- Chemical/Biological Source Characterization, Richard Fry, DTRA, R. Ian Sykes, L-3 Titan, Ronald Kolbe, NGIT
- Sensor Placement Optimization, Mr. Keith Gardner, Northrop Grumman IT
- Sensor Location & Optimization Tool Set: Presentation - Paper, Mr. Michael J. Smith, ITT Industries, Advanced Engineering & Sciences
- Hazard Prediction with Nowcasting, Jason Nachamkin and John Cook, Naval Research Laboratory, and Michael Frost, Daniel Martinez, and Gary Sprung Computer Sciences Corporation
- Tracking Atmospheric Plumes Using Stand-off Sensor Data, Robert C. Brown, David Dussault, and Richard C. Miake-Lye Aerodyne Research, Inc. Patrick Heimbach, Department of Oceanography, Massachusetts Institute of Technology

Working Group II - Special Topics I:

Session B-II Agenda

- Chemical, Biological, Radiological, and Nuclear (CBRN) and Medical Communities of Interest (COI) Information Sharing, Mr. Doug Hardy, JPM IS SSA Manager
- Providing Capabilities-Based Analytic Support In Dynamic Operational Environments, Mr. Mark Neff, Mr. Greg Wells and Mr. E. Mark Chicoine, Booze / Allen / Hamilton
- Development and Implementation of a Model for Predicting the Aerosolization of Agents in a Stack, Teri J. Robertson, Douglas S. Burns, Jeffrey J. Piotrowski, Dustin B. Phelps, Veeradej Chynwat and Eileen P. Corelli, ENSCO, Inc.
- Contamination Avoidance at Seaports of Debarkation: Presentation - Paper, Mr. Donald W. Macfarlane, David H. Drummond and William J. Ginley, NBC Battlefield Management Team, Edgewood Chemical Biological Center
- Advances in Biotechnology and the Biosciences for Warfighter Performance and Protection, Dr. Larry Regens, University of Oklahoma Health Sciences Center

Working Group III - Battlespace Management:

Session B-III Agenda

- A Bayesian Approach for Assessing Confidence in a Biological Warfare (BW) Detection Event, Mr. Patrick L. Berry, U.S. Army Edgewood CB Center
- A New Bio IMS for Simultaneous Detection of CWAs and Biomaterials , Dr. Jürgen Leonhardt Flight Services, Inc
- Chem-Bio Protection Without Chem-Bio Sensors: Low Cost, Dual Use, Alternative Sensor and Information Architectures, Mr. Steven S. Streetman, ENSCO, Inc.

Working Group IV - Decision Making and Support:

Session B-IV Agenda

- The Chemical and Biological Defense Information Analysis Center (CBIAC), a Knowledge Management Source for Authoritative Information, Donald McGonigle, KM Program Manager
- Flatland Visualization of A Decision Support Tool Architecture, Mr. Thomas Preston Caudell, Department of ECE, University of New Mexico
- Scenarios with the CBRN Data Model, Stephen Helmreich, Computing Research Laboratory, NMSU and Sundara Vadlamudi and Markus Binder, Monterey

- Institute of International Studies
- Machine Intelligence in Decision-making (MIND) Automated Generation of CB Attack Engagement Scenario Variants, Nadipuram R. Prasad, Arjun S. Rangamani, Timothy J. Ross, M. M. Reda Taha, Frank Gilfeather
- Methods for Understanding Human Interface Requirements for Decision Support Tools, Bill Ogden, Jim Cowie, and Chris Fields, New Mexico State University
- Allocation of Resources in CB Defense: Optimization and Ranking, J. Cowie, H. Dang, B. Li, Hung T. Nguyen, NMSU and F. Gilfeather, UNM

Working Group V - Special Topics: Test and Evaluation:

Session B-V Agenda

- Test and Evaluation (T&E) Thrust Area Overview, Eric Lowenstein, T&E Manager, Modeling & Simulation / Battlespace
- Reliable Discrimination of High Explosive and Chemical / Biological Artillery Using Acoustic Sensors, Myron E. Hohil, Sachi Desai, and Amir Morcos, US Army RDECOM-ARDEC
- Infrared Scene Simulation for Chemical Standoff Detection System Evaluation, Peter Mantica, Chris Lietzke, and Jer Zimmermann, ITT Industries, Advanced Engineering and Sciences Division and Fran D'Amico, Edgewood Chemical Biological Center ARDEC
- Neutrotest - A Neutron Based Nondestructive Device for Explosive Detection, Dr. Jürgen Leonhardt
- Dynamic Multi Sensor Management System, Mr. Thomas Sanderson and Mr. Fred Yacoby
- A Bayesian Approach for Assessing Confidence in a Biological Warfare (BW) Detection Event, Mr. Patrick L. Berry, U.S. Army Edgewood CB Center

Thursday, 28 October 2005

BREAKOUT SESSION C

Working Group I - Dispersion Modeling and Sensor Data Fusion:

Session C-I Agenda

- An Atmospheric Chemistry Module for Modeling Toxic Industrial Chemicals (TICs) in SCIPUFF, Douglas S Burns, Veeradej Chynwat, Jeffrey J Piotrowski, Kia Tavares, and Floyd Wiseman, ENSCO, Inc.
- Chemical and Biological Hazard Environmental Prediction, Mr. Michael Armistead, NSWCC, Dahlgren Division (NSWCDD)
- Development and Implementation of a Model for Predicting the Aerosolization of Agents in a Stack, Teri J. Robertson, Douglas S. Burns, Jeffrey J. Piotrowski, Dustin B. Phelps, Veeradej Chynwat and Eileen P. Corelli, ENSCO, Inc.
- Nowcasting and Urban Interactive Modeling Using Robotic and Remotely Sensed Data, James Cogan, Robert Dumais, and Yansen Wang, Meteorological Modeling Branch, Battlefield Environment Division, Computational & Information Sciences Directorate, U.S. Army Research Laboratory

- MSG Ground (Video)
- Quasi Steady Run (Video)
- Meandering Wind (Video)
- Measurement of Coastal & Littoral Toxic Material Tracer Dispersion, Dr. Robert E. Marshall
- Coupled Air -- Sea Modeling for Improved Coastal Dispersion Prediction, Julie Pullen, Marine Meteorology Division, Naval Research Laboratory

Working Group II - Current Ops Effect S & T Projects:

Session C-II Agenda

- JOEF Prototype Development Activities, Dr. Tom Stark, Cubic Defense Applications
- Next Generation Modeling of Operational Effects and CHEMRAT and Updating Air Force Manuals 10-2602 & 10-2517, Maj William Greer, AFRL HEPC
- Impact Assessment Tool, Dr. Ben Swindlehurst, Dstl, Mr. Darrell Lochtefeld, Anteon Corporation and Mr. Andrew Solman, Dstl
 - AOCA (Video)
 - Trace Double (Video)
- CB System Military Worth Assessment Toolkit, Chris Gaughan, ECBC, Dennis Jones, ITT, Derrick Briscoe, ITT, and Jim Sunkes, ITT
- Predictive Models for Chem-Bio Human Response, Casualty Human Response, Estimation and Patient Loads, Gene McClellan, Karen Cheng, and Jason Rodriguez

Working Group III - Battlespace Management:

Session C-III Agenda

- "Net-Ready" CBRN Sensors – A Way Forward..., Chuck Datte, Ritesh Patel and David W. Godso
- Wirelessly Enabling Legacy Sensor Systems for Rapid Deployment and Monitoring, Mr. Joshua Pressnell, RTI
- Dynamic Multi Sensor Management System, Mr. Thomas Sanderson and Mr. Fred Yacoby

Working Group IV - Decision Making and Support:

Session C-IV Agenda

- Monotone Measure Theory as a Method for Combining Evidence in Threat Scenarios, Greg M. Chavez, Timothy J. Ross, Mahmoud Reda Taha, Ram Prasad
- Algorithmically Generated Music Enhances VR Decision Support Tool, Dr. Panaiotis, Department of Music & Department of Electrical and Computer Engineering, The University of New Mexico
- Exploring Optimization Methodologies for Systematic Identification of Optimal Defense Measures for Mitigating CB Attacks, Roshan Rammohan, Molly McCuskey, Mahmoud Reda Taha, Tim Ross and Frank Gilfeather, University of New Mexico and Ram Prasad, New Mexico State University
- DTRA -Modeling and Simulation/Battlespace - BO05MSB070: Multivariate Decision Support Tool for CB Defense, Dr. Frank Gilfeather, UNM

Working Group V - Special Topics: Test and Evaluation:

Session C-V Agenda

- CBRN Data Model CBRN Data Model Implementation Approach, Mr. William Snee, MSIAC/ Alion Science and Technology and Professor Tom Johnson, Naval Postgraduate School
- Chemical Homeland Security System: C-HoSS, Mr. Kevin Kennedy, Chemical Compliance Systems, Inc.

BREAKOUT SESSION D

Working Group I - Dispersion Modeling and Sensor Data Fusion:

Session D-I Agenda

- Release and Atmospheric Dispersal of Liquid Agents, Theo Theofanous (PI), University of California and Rich Couch, Program Manager, Lawrence Livermore National Laboratory
- Modeling and Simulation to Support Virtual Chemical Hazard Environments, Dr. Jeffery D. Peterson, Dr. James A. Kleimeyer and Dr. Richard J. Green, West Desert Test Center, Dugway Proving Ground
- Proposed Translation of Joint Effects Model (JEM) Accuracy Requirement Into a Measurable Acceptability Criterion, Steve Warner, Nathan Platt and James F. Heagy, Institute for Defense Analyses

Working Group II - Operations Effects Modeling:

Session D-II Agenda

- Combined Defense, Mr. Keith Gardner, Northrop Grumman IT
- Health Effects Decision Support Tool for Civilian CB Air and Water Attack Scenarios, Dr. Shanna Collie, Toxicologist and Project Manager, Tetra Tech
- Reality Simulation to Train for Prevention, Deterrence, Response, and Recovery for Chem Bio Events, Mr. Scott Milburn, Reality Response
 - SVS at Fort Benning (*Video*)
 - Dismounted Simulation (*Video*)

Monday, October 24

3:00 PM-5:00 PM

Registration

Tuesday, October 25

7:30AM -8:30AM

Late Registration and Continental Breakfast

8:30AM-8:45AM

Welcome and Introduction

8:45AM-9:15AM

Keynote – BG Stephen V. Reeves, USA

Joint Program Executive Officer for Chemical Biological Defense

9:15AM-9:45AM

Keynote – Dr. Charles R. Gallaway

Director Chem Bio Defense

Science and Technology Directorate

Defense Threat Reduction Agency

9:45AM-10:15AM

Keynote – COL Don Bailey, USA

Deputy Director, Joint Requirements Office for

Chemical Biological, Radiological and Nuclear Defense

10:15AM-10:45AM

Break

10:45AM-11:10AM

Technology Transitioning Overview

11:10AM-11:35AM

Joint Project Manager Information Systems Program Overview

11:35AM-1:00PM

Lunch

1:00PM-1:30PM

Joint Effects Model Program Overview

1:30PM-2:00PM

Joint Operational Effects Federation Program Overview

2:00PM-2:30PM

Joint Warning and Reporting Network Program Overview

2:30PM-3:00PM

Joint Project Manager Information Systems Integration Overview

3:00PM-3:30PM

**Break & Joint Project Manager Information Systems
Demonstration**

3:30PM-4:00PM

Joint Science and Technology Office Program Overview

4:00PM-4:30PM

Environmental Hazard Prediction Thrust Area Overview

4:30PM-5:00PM

Operations Effects Thrust Area Overview

5:00PM-5:30PM

Battlespace Management Thrust Area Overview

5:30PM

Adjourn for the day

5:30PM-6:30PM

**Reception & Joint Project Manager Information Systems
Demonstration**

Wednesday, October 26

8:00AM-8:30AM	Registration and Continental Breakfast
8:30AM-8:35AM	Admin Remarks
8:35AM-9:10AM	Agent Fate Program Overview
9:10AM-9:30AM	Decision Support Program Overview
9:30AM-9:50AM	Research Development and Engineering Command (RDECOM) Overview
9:50AM-10:20AM	Break & Joint Project Manager Information Systems Demonstration

10:20AM-12:00PM Breakout Session A
Working Group I - Dispersion Modeling and Sensor Data Fusion
Session Chair: John Pace

10:20 AM – 10:50 AM	John Pace	Overview of Hazard Prediction Modeling Program
10:55 AM – 11:25 AM	Paul Thomas	Source Term Estimation Module (STEM)
11:30 AM – 12:00 PM	Ian Griffiths	STEM demo

Working Group II – Chemical Agent Persistence and Prediction Modeling
Session Chair: Mark Fagan

10:20 AM – 10:50 AM	Dr. Arianus R. Hin	Agent Fate Predictive Model Methodology
10:55 AM – 11:25 AM	Dr. Hodayun	Agent Fate 1 st Principles Modeling
11:30 AM – 12:00 PM	Dr. Evans	Quantum Chem Theoretical Modeling

Working Group III - Battlespace Management
Session Chair: Bill Ginley

10:20 AM – 10:50 AM	Mr. Bill Ginley	Shared COP
10:55 AM – 11:25 AM	Mr. James Reilly	Next Generation CB Battle Management System
11:30 AM – 12:00 PM	Mr. James Reilly	Next Generation CB Battle Management System

Working Group IV - Decision Making and Support
Session Chair: Scott Cahoon

10:20 AM – 10:50 AM	Dr. Jeffrey Grotte	Decision Support Analytical Framework
10:55 AM – 11:25 AM	Mr. Michael Kierzewski, Mr. King	Virtual Prototyping Feasibility/Benefit and CB Common Knowledge Base
11:30 AM – 12:00 PM	Dr. Frank Gilfeather	Chemical and Biological Defense Multivariate Decision Support Tool

Working Group V - Special Topics: Test and Evaluation
Session Chair: Eric Lowenstein

10:20 AM – 10:50 AM	Dr. William Brence	A Quantitative Tool for the Identification, Correlation, and Selection of Chemical Agent Simulants for OT&E; Implications for and Applications to Current and Future Programs
10:55 AM – 11:25 AM	Avidan	MNS/CBRN System Integration

11:30 AM – 12:00 PM	TBD	TBD
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12:00PM-1:00PM

Lunch (On Own)

1:00PM-3:30/5:00PM

Breakout Session B

Working Group I - Dispersion Modeling and Sensor Data Fusion

Session Chair: John Pace

1:00 PM – 1:30 PM	Dr. Deborah Fish	Fusion of CB Data and Model Output
1:30 PM – 2:00 PM	Mr. Rick Fry	Chemical/Biological Source Characterization
2:00 PM – 2:30 PM	Mr. Keith Gardner	Optimizing Sensor Placement for CB Defense
2:30 PM – 3:00 PM	Mr. Mike Smith	Sensor Location Optimization Tool Set
3:00 PM – 3:30 PM	Jason Nachamkin	Hazard Prediction with Nowcasting

Working Group II – Special Topics I

Session Chair: Mark Fagan

1:00 PM – 1:30 PM	Mr. Doug Hardy	The Need for CBRN and Medical COI Interoperability and the Proposed Way Forward
1:30 PM – 2:00 PM	Mr. Mark Neff	Providing Capabilities-Based Analysis in Dynamic Operational Environments: Leveraging Integrated Architecture and Use Cases to Define and Deliver Rapid Capabilities
2:00 PM – 2:30 PM	Mr. David Gregory	Chemical and Biological Warfare Modeling Library (CBWLIB)
2:30 PM – 3:00 PM	Mr. Donald McFarlane	Contamination Avoidance at Seaports of Debarkation (CASPOD) ACTD: A Study in the Importance of Early User Involvement During User Interface and System Capabilities Development
3:00 PM – 3:30 PM	Dr. James L. Regens	Advances in Biotechnology and the Biosciences for Warfighter Performance and Protection

Working Group III - Battlespace Management

Session Chair: Bill Ginley

1:00 PM – 1:30 PM	Mr. Patrick Berry	A Bayesian Approach for Assessing Confidence in a Biological Warfare (BW) Detection Event
1:30 PM – 2:00 PM	Mr. Thomas Sanderson	Hyperspectral Mid-Range Toxic Gas Detection System
2:00 PM – 2:30 PM	Dr. Juergen Leonhardt	A New BIO IMS for Simultaneous Detection of CWA Material
2:30 PM – 3:00 PM	Mr. Thomas Sanderson	Multi-Sensor Battlespace Management Architecture
3:30 PM – 4:00 PM	Mr. Steven Streetman	Chem-Bio Protection Without Chem-Bio Sensors: Low Cost, Dual Use Alternative Sensor and Information Architectures

Working Group IV - Decision Making and Support

Session Chair: Scott Cahoon

1:00 PM – 1:30 PM	Mr. Donald McGonigle	The Chemical and Biological Defense Information Analysis Center (CBIAC), a Knowledge Management Source for Authoritative Information
1:30 PM – 2:00 PM	Dr. Rafael Alonso	A Chem-Bio Information System for Rapid Knowledge Acquisition to Support Bio-weapons Countermeasures
2:00 PM – 2:30 PM	Caudell	Flatland Virtual Data Decision Support Tool
2:30 PM – 3:00 PM	Dr. Steve Helmreich	Coordinating CB engagement scenarios with the CBRN
3:00 PM – 3:30 PM	BREAK	
3:30 PM – 4:00 PM	Prasad	Data Model Machine Intelligence in Decision-making (MInD) Automated Generation of <i>CB</i> Attack Engagement Scenario Variants
4:00 PM – 4:30 PM	Dr. Bill Ogden	Methods for Understanding Human Interface Requirements for Decision Support Tools
4:30 PM – 5:00 PM	Dr. Hung Nguyen	Allocations of Resources in CB Defense: Optimization and Ranking

Working Group V - Special Topics: Test and Evaluation

Session Chair: Eric Lowenstein

1:00 PM – 1:30 PM	Dr. Timothy Shelly	A Distributed Processing Sensor Network for Detect-To-Warn Capability
1:30 PM – 2:00 PM	Dr. Jonathan Davis	Development of Plague Outbreak Decision Tool
2:00 PM – 2:30 PM	Dr. Myron Hohil	Reliable Discrimination of High Explosive and Chemical/Biological Artillery Using Acoustic Sensors
2:30 PM – 3:00 PM	TBD	TBD
3:00 PM – 3:30 PM	BREAK	
3:30 PM – 4:00 PM	Dr. Peter Mantica	Infrared Scene Simulation for Chemical Standoff Detection System Evaluation
4:00 PM – 4:30 PM	Dr. Juergen Leonhardt	Neutro Test – A Neutron Based Non-Destructive Device for Finding Hidden Explosives
3:30 PM – 4:00 PM	Dr. Peter Mantica	Infrared Scene Simulation for Chemical Standoff Detection System Evaluation

5:00 PM Adjourn for the day

5:30 PM Social Hour

6:30 PM-8:00 PM CBIS Annual Banquet
Guest Speaker Gary Yamamoto “Restore the Passion: For Work and For Life!”

Thursday, October 27

8:00AM-8:30AM **Continental Breakfast**

8:30AM-8:35AM Admin Remarks

8:35AM-10:00AM Breakout Session C

Working Group I - Dispersion Modeling and Sensor Data Fusion

Session Chair: John Pace

8:35 AM – 9:00 AM	Dr. Douglas Burns	An Atmospheric Chemistry Module for Modeling Toxic Industrial Chemicals
9:00 AM – 9:30 AM	Mr. Mike Armistead	Chemical and Biological Hazard Environmental Prediction
9:30 AM – 10:00 PM	Ms. Teri Robertson	Development of a Model for Predicting the Aerosolization of Agents in a Stack

Working Group II – Current Ops Effect S & T Projects

Session Chair: Mark Fagan

8:35 AM – 9:00 AM	Dr. Tom Stark	JOEF Prototype Development
9:00 AM – 9:30 AM	Maj William Greer	Next Generation model Development
9:30 AM – 10:00 PM	Darrell Lochtefeld	Impact Assessment Tool

Working Group III - Battlespace Management

Session Chair: Bill Ginley

8:35 AM – 9:00 AM	Mr. Javad Sedehi	Battlespace Management Field Trip
9:00 AM – 9:30 AM	Mr. Jack Berndt	Engineering NBC-RPM
9:30 AM – 10:00 PM	Mr. David Godso	Net-Ready CBRN Sensors -- The Way Ahead

Working Group IV - Decision Making and Support

Session Chair: Scott Cahoon

8:35 AM – 9:00 AM	Mr. Gregory Chavez	Monotone Measure Theory as a Method for Combining Evidence in Threat Engagements
9:00 AM – 9:30 AM	Dr. Panaiotis	Algorithmically Generated Music Enhances VR Decision Support Tool
9:30 AM – 10:00 PM	Dr. Roshan Rammohan	Exploring Optimization Methodologies for Systematic Identification of Optimal Defense Measures For Mitigating <i>CB</i> Attacks

Working Group V - Special Topics: Test and Evaluation

Session Chair: Eric Lowenstein

8:35 AM – 9:00 AM	Mr. Peter Mantica	Active Standoff Chemical Detection Model for System Studies
9:00 AM – 9:30 AM	Mr. William Snee	Phased Data Model Implementation Approach
9:30 AM – 10:00 PM	Dr. George Thompson	Chemical Homeland Security System (C-HoSS)

10:00AM-10:30AM **Break & Joint Project Manager Information Systems
Demonstration (Last Chance to view Demo)**

10:30AM-12:00PM Breakout Session C Continued

Working Group I - Dispersion Modeling and Sensor Data Fusion

Session Chair: John Pace

10:30 AM – 11:00 AM	Julie Pullen	Coupled Air-Sea Modeling for Improved Coastal Urban Dispersion Prediction
11:00 AM – 11:30 AM	Rob Marshall	Measurement of Coastal & Littoral Toxic Material Tracer Dispersion
11:30 AM – 12:00 PM	John Hannan	Intercomparison of Four Rockle-Based Urban Dispersion Models

Working Group II – Special Topics II

Session Chair: Mark Fagan

10:30 AM – 11:00 AM	Maj Greer	CHEMRAT and AFMAN 10-2602 Persistence Modeling
11:00 AM – 11:30 AM	Tim Gaughan	CB System Military Worth Assessment Toolkit
11:30 AM – 12:00 PM	Dr. Gene McClellan	Predictive Models for Chem-Bio Human Response, Casualty Estimation and Patient Loads

Working Group III - Battlespace Management

Session Chair: Bill Ginley

10:30 AM – 11:00 AM	Mr. Joshua Pressnell	Wirelessly Enabling Legacy Sensor Systems for Rapid Deployment and Monitoring
11:00 AM – 11:30 AM	Mr. Thomas Sanderson	Performance Quality Monitoring Architecture for Sensor Networks
11:30 AM – 12:00 PM	TBD	

Working Group IV - Decision Making and Support

Session Chair: Scott Cahoon

10:30 AM – 12:00 PM	Dr. Frank Gilfeather	Multivariate Decision Support Tool Set-up
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Working Group V - Special Topics: Test and Evaluation

Session Chair: Eric Lowenstein

10:30 AM – 11:00 AM		Program Decision Issues
11:00 AM – 11:30 AM		Program Decision Issues
11:30 AM – 12:00 PM		Program Decision Issues

12:00PM-1:30PM **Lunch (On your own)**

1:30PM-3:30PM

Breakout Session D (and concurrent Executive Session)

Working Group I - Dispersion Modeling and Sensor Data Fusion

Session Chair: John Pace

1:30 PM – 2:00 PM	Theo Theofanous	Release and Atmospheric Dispersal of Liquid Agents
2:00 PM – 2:30 PM	Dr. Jeffrey Peterson	Modeling and Simulation to Support Virtual Chemical Hazard Environments
2:30 PM – 3:00 PM	Dr. Steve Warner	Translation of JEM Accuracy Requirement into a Measurable Acceptability Criterion

Working Group II - Operations Effects Modeling

Session Chair: Mark Fagan

1:30 PM – 2:00 PM	Mr. Keith Gardner	Combined Defense Model
2:00 PM – 2:30 PM	Dr. Shanna Collie	Health Effects Decision Support Tool for Civilian CB Air and Water Attack Squadron
2:30 PM – 3:00 PM	Mr. Scott Milburn	Employing Military Virtual Reality Simulation Technology to Train for Prevention, Deterrence, Response, and Recovery for Chem Bio Events

Working Group III - Battlespace Management

Session Chair: Bill Ginley

1:30 PM – 2:00 PM		Program Decision Issues
2:00 PM – 2:30 PM		Program Decision Issues
2:30 PM – 3:00 PM		Program Decision Issues

Working Group IV - Decision Making and Support

Session Chair: Scott Cahoon

1:30 PM – 3:30 PM	Cahoon, Gilfeather	Presentation of Chemical and Biological Defense Multivariate Decision Support Tool to Dr. Charles Gallaway
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Working Group V - Special Topics: Program Decision Issues

Session Chair: Eric Lowenstein

1:30 PM – 3:30 PM		Program Decision Issues
2:00 PM – 2:30 PM		Program Decision Issues
2:30 PM – 3:00 PM		Program Decision Issues

3:30PM

Conference Adjourns

*****Following for JPM IS personnel, JSTO personnel and Session Chairs*****

4:00PM-5:00PM

Hotwash and Summary from Working Group Chairs

5:00PM

Adjourn for the day

Friday, October 28

8:00AM-8:30AM

Continental Breakfast

8:30AM-10:00AM

Executive Session

10:00AM

Conference Adjourns



JPM IS Integrated Architecture and Software Support Activity

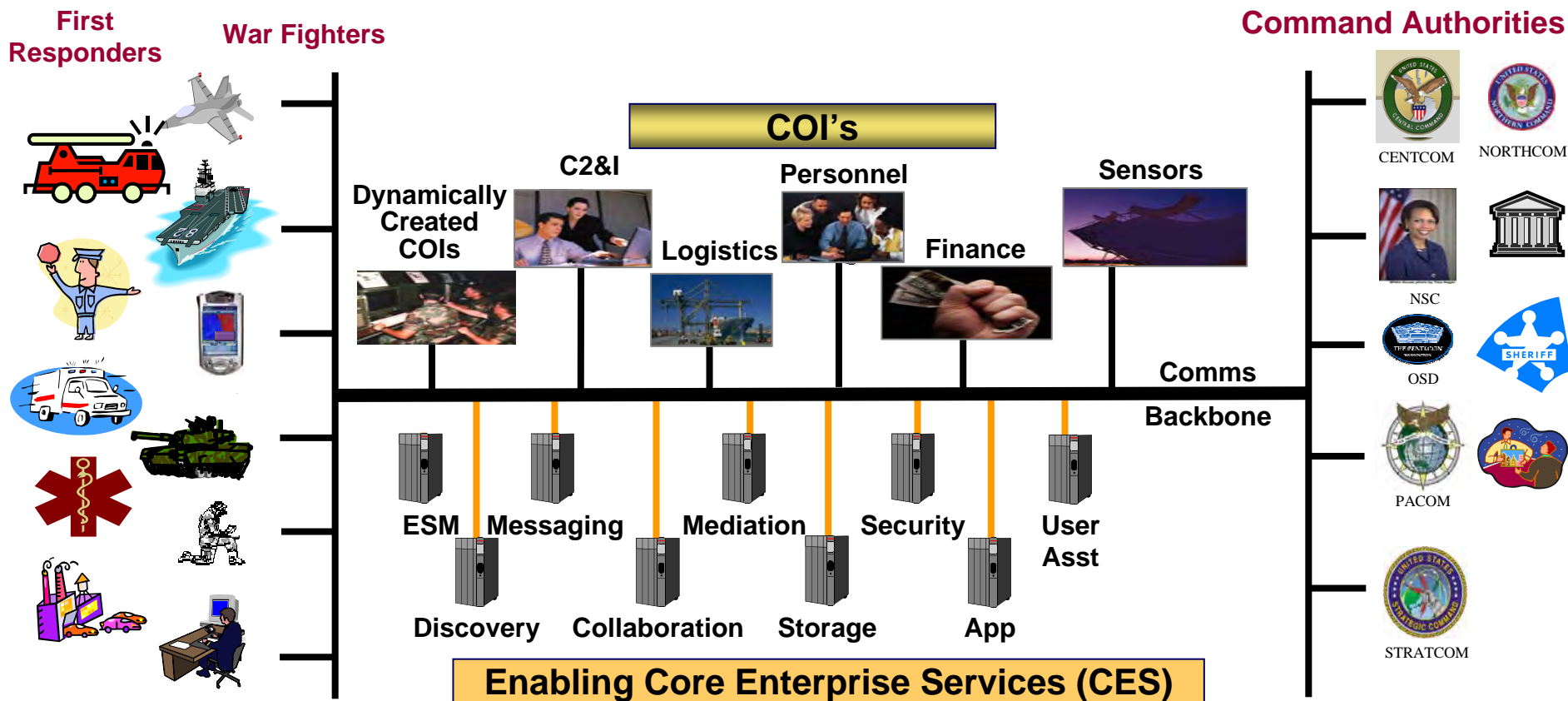
Kevin Adams
JPM IS Lead Integrator
SSA Director
(858) 537-0198
Kevin.Adams@jpmis.mil



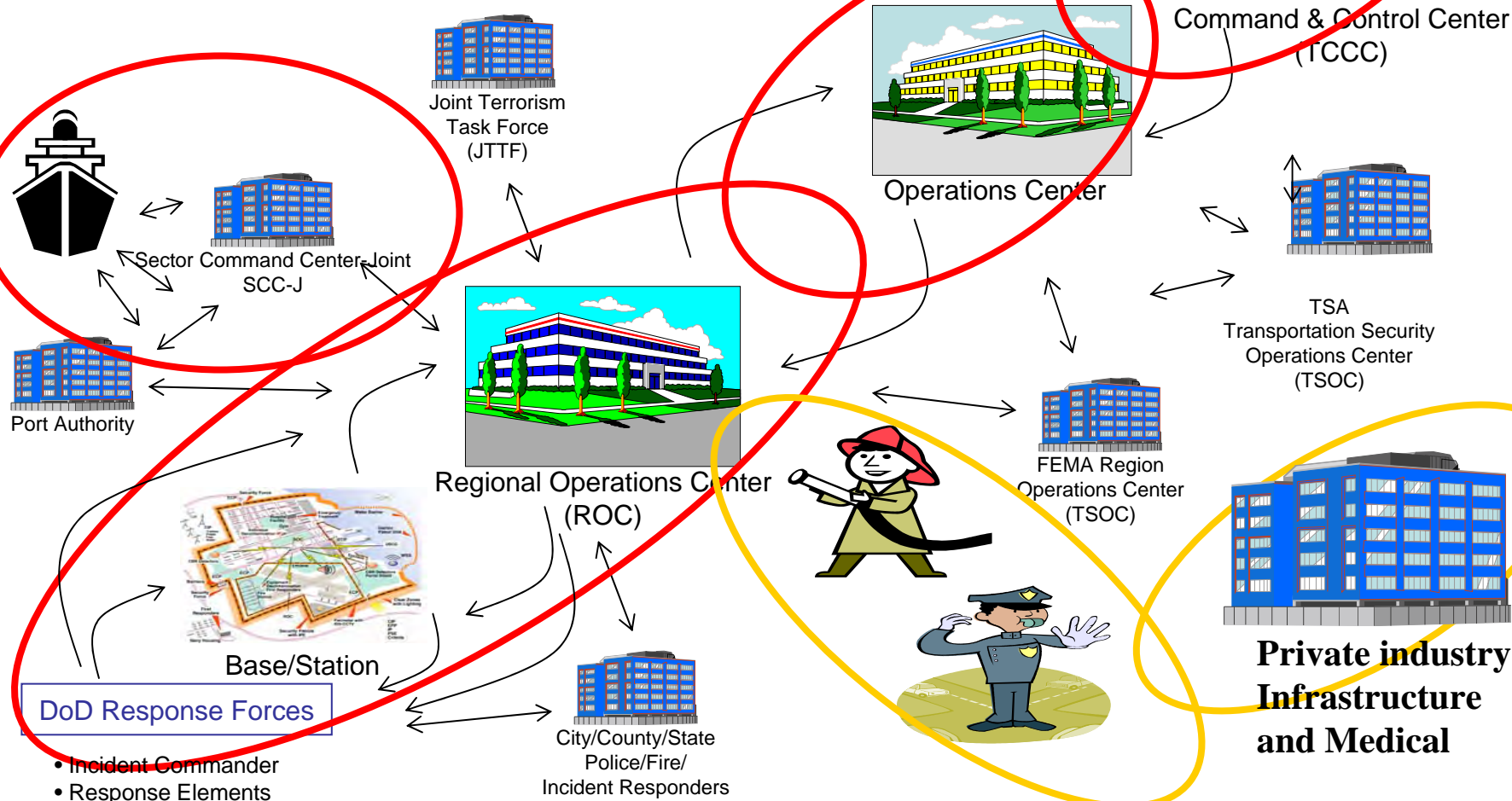
JPM IS Integrated Architecture



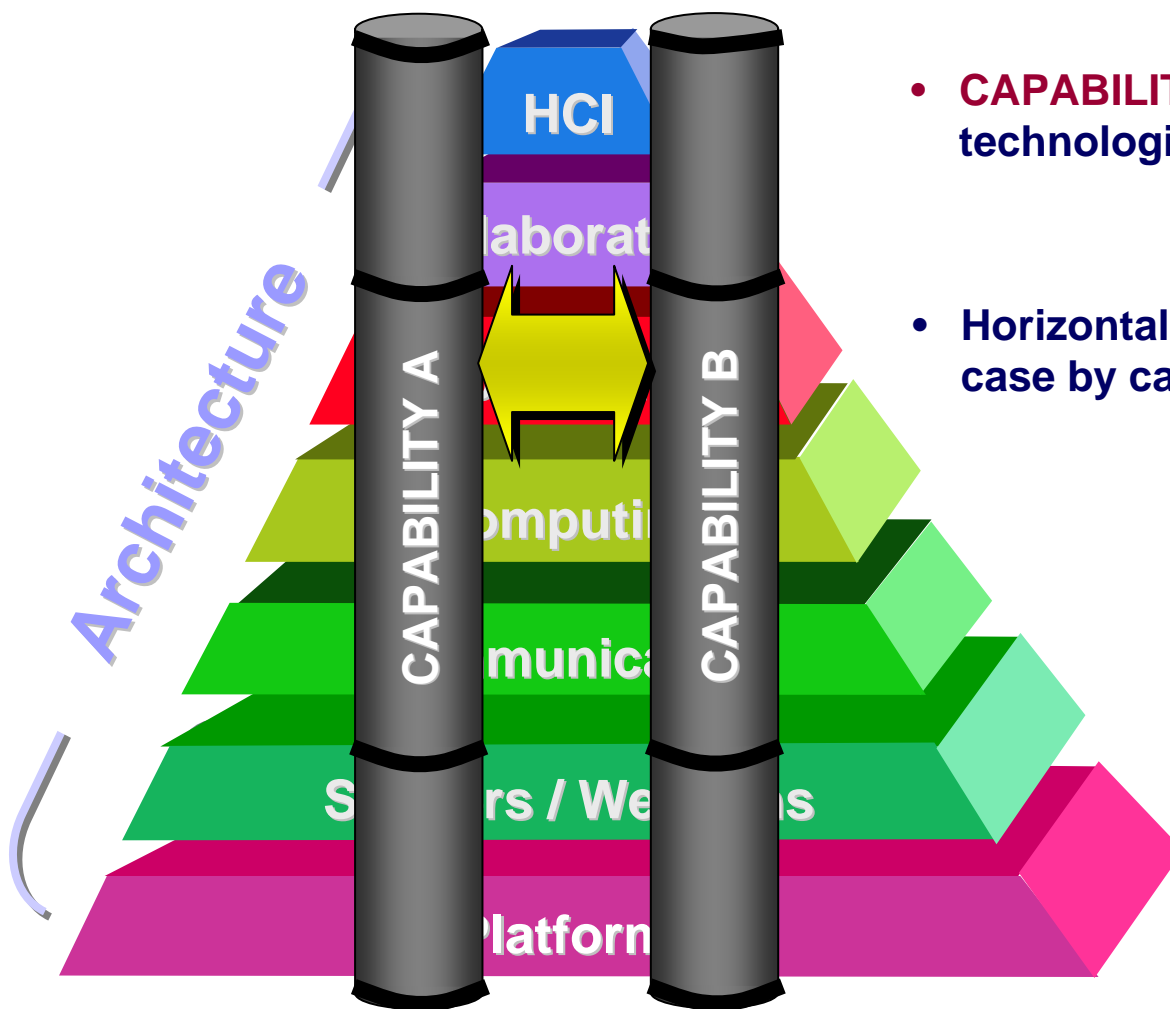
21st Century C4ISR System



JPM IS CBD Integration Across COIs



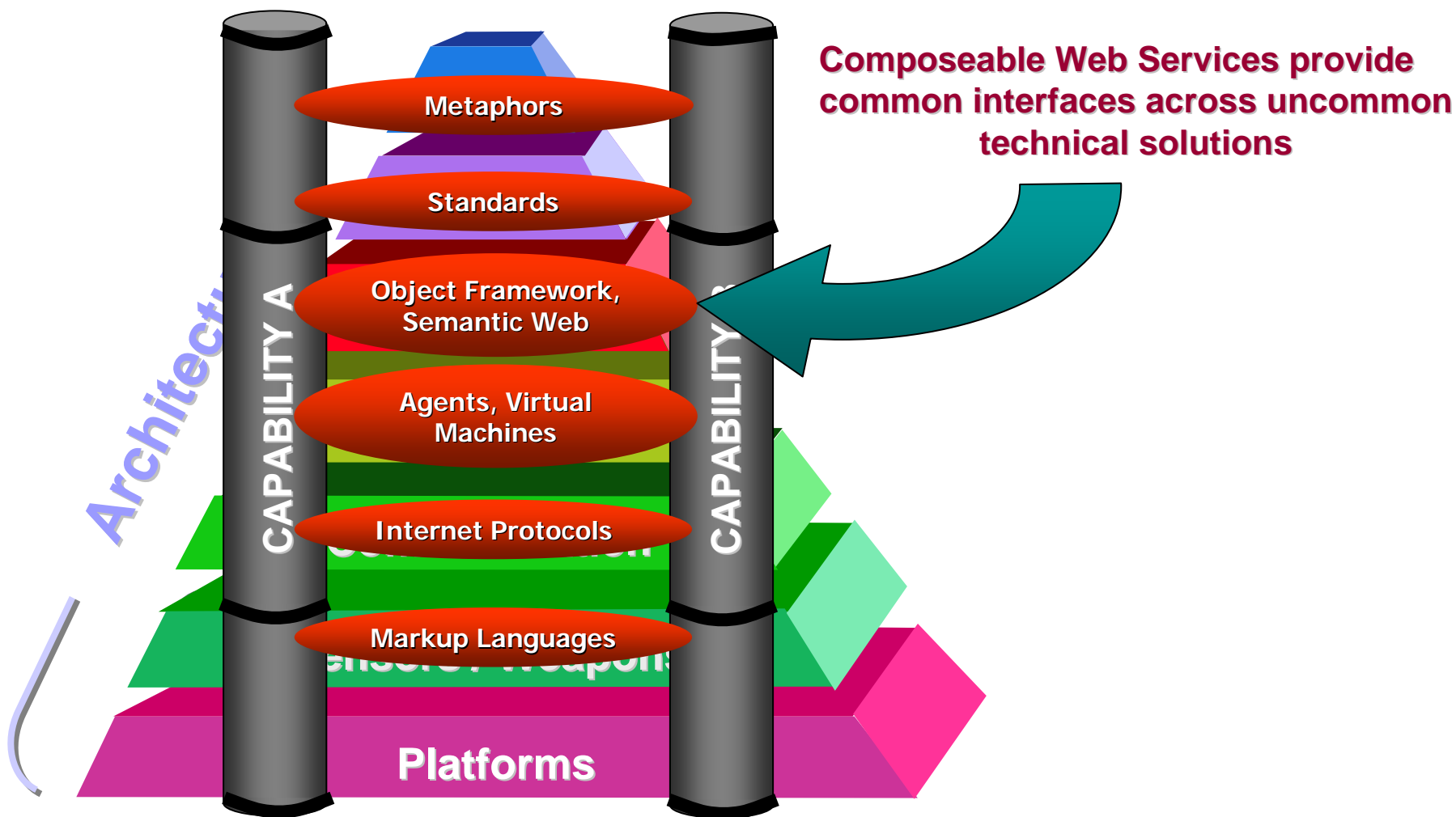
Building Blocks of Modern C4I System



- **CAPABILITIES** are vertically integrated technologies that are “fixed”
- Horizontal integration is costly and done case by case

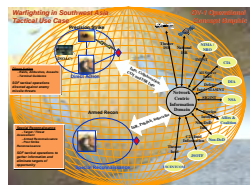


Interoperability and Access Through Composeability

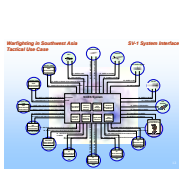


What are we Architecting?

Architecture Effort Visualizations

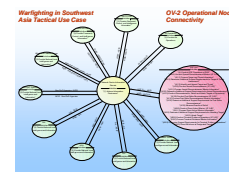
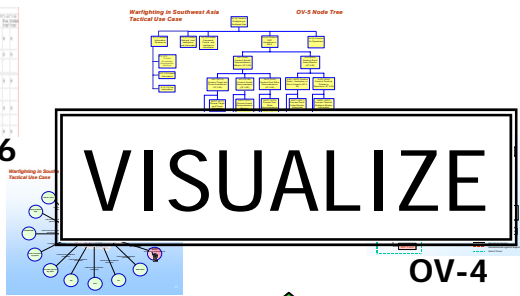


OV-1



SV-1

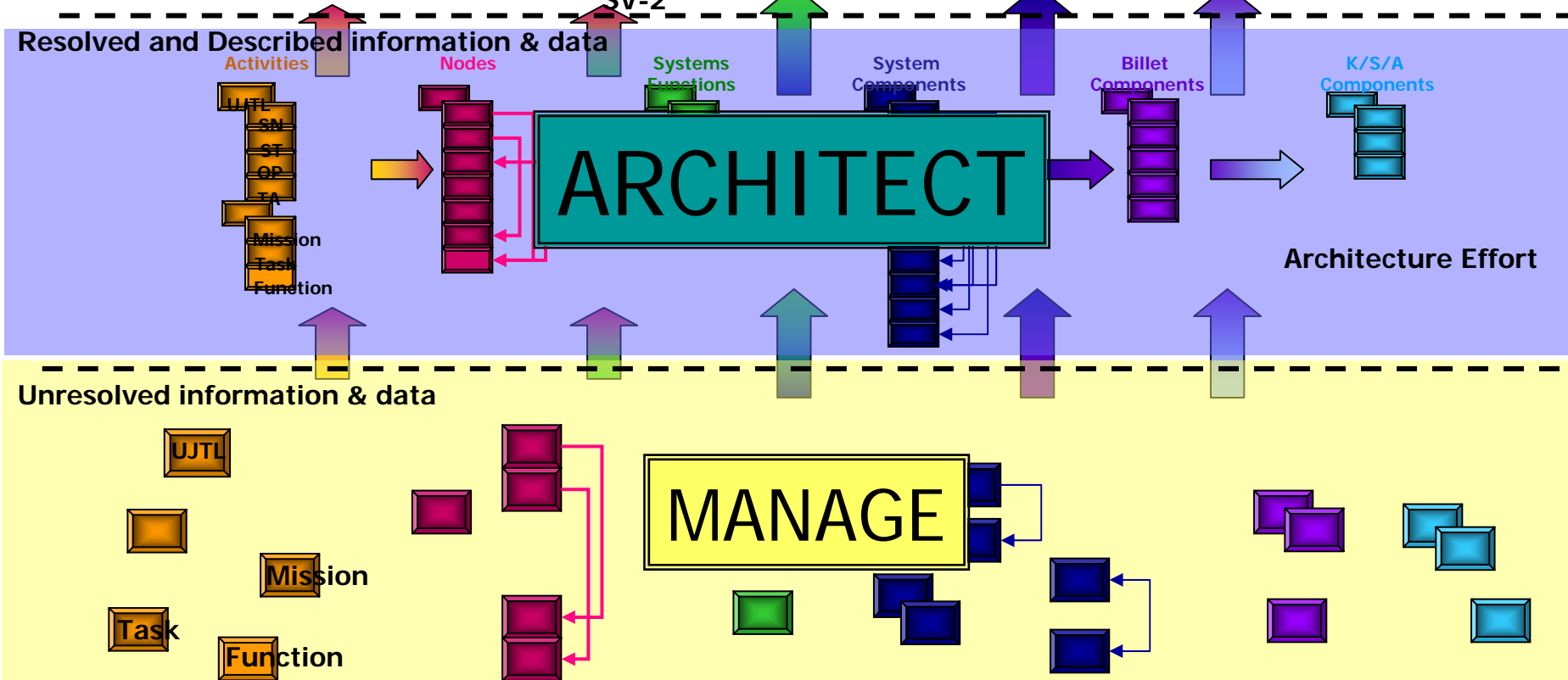
OV-3/SV-6



OV-2



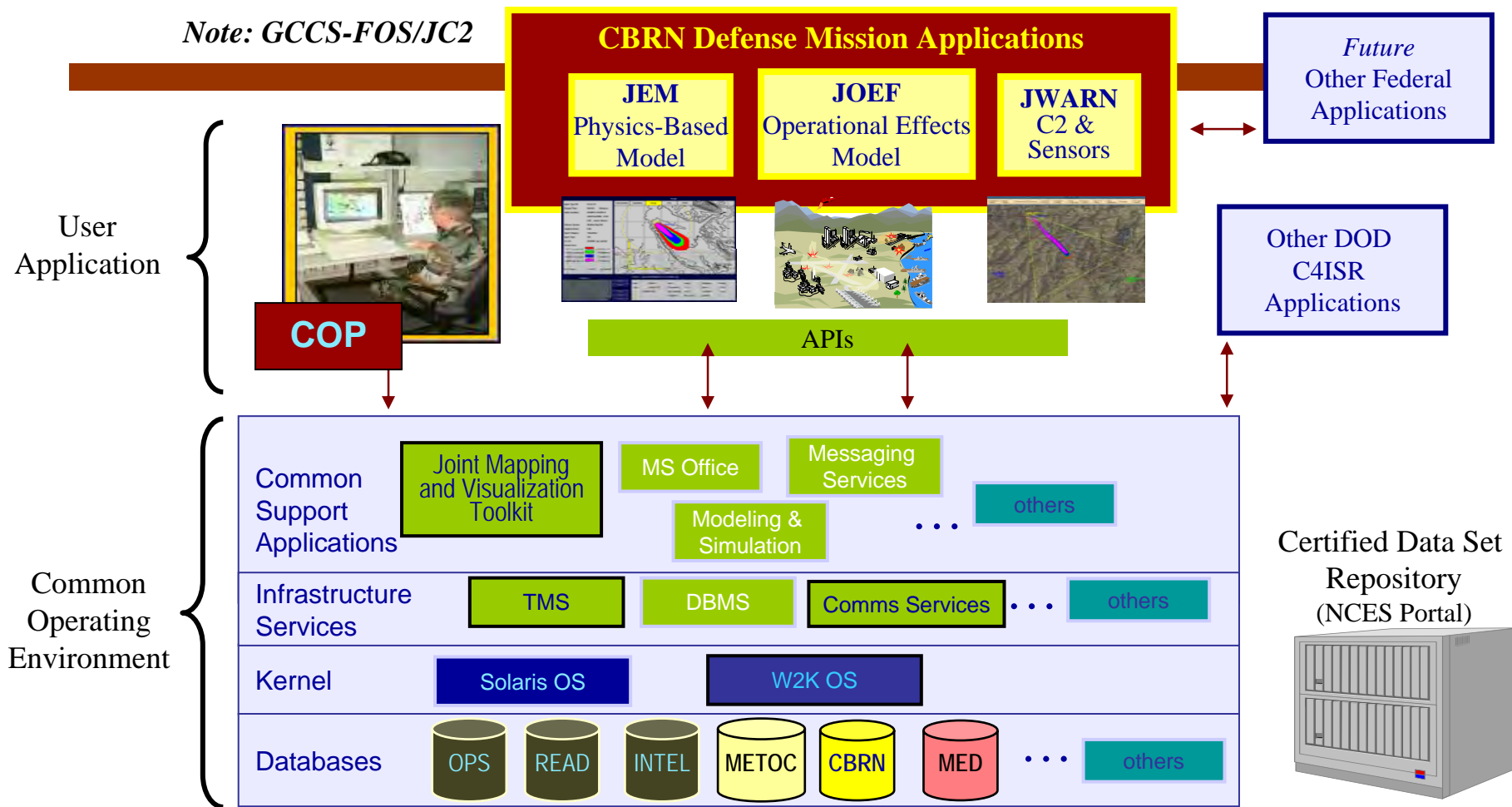
Program Documents & Reports





CBRN Defense Battle Management Architecture

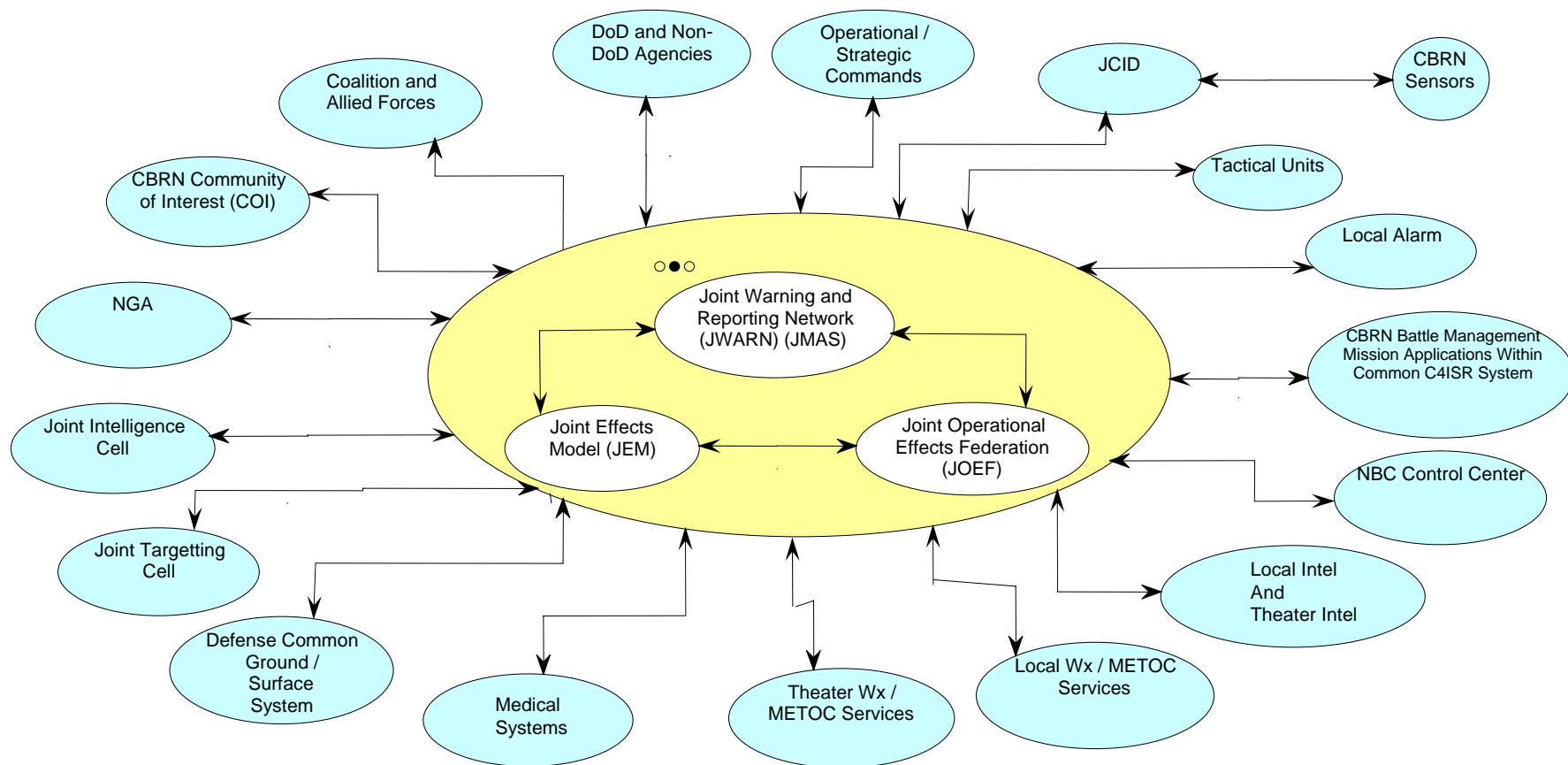
Note: GCCS-FOS/JC2



JPM IS Integration/Interoperability of Core Components for CBRN "Community of Interest" Service



CBRN INFORMATION SYSTEMS



Enterprise Architecture is captured within the DoDAF Products down to the software architecture level of abstraction

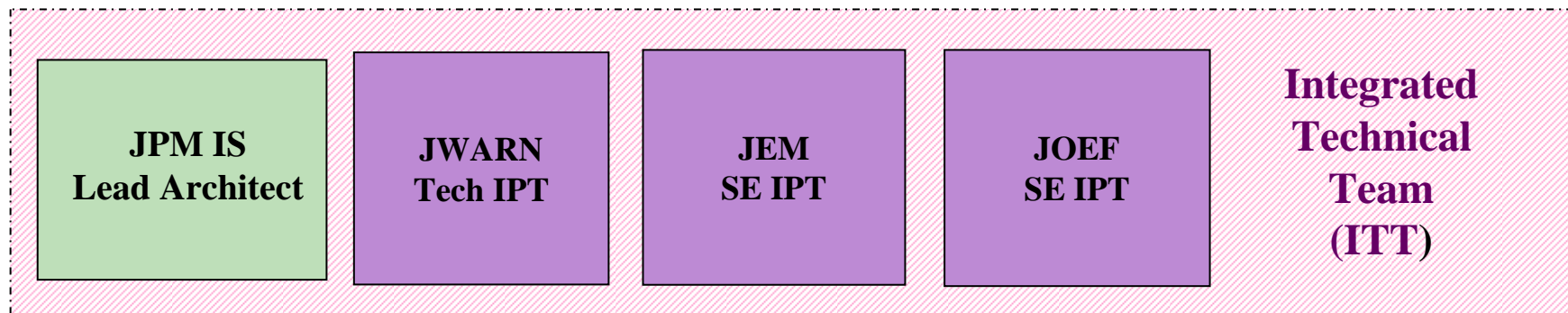


JPM IS Architecture Goals

- **Focus on the warfighter**
 - Architecture is invisible, presentation, use, and interpretation of CBD data across the various systems is consistent and seamless
 - Architecture supports current and planned requirements
 - System is available, robust, and easy to use
 - The right system assets are fielded on the right platforms at the right time
 - System is flexible to support known and future CONOPS
- **Focus on the taxpayer**
 - Build system using enterprise architecture and industry standards
 - Build reusable components
 - Build a system that can adapt to changing C4I landscape
 - Build system that can easily adopt new CBD technologies and unplanned requirements.



Architecture Methodology



- **ITT Goals:**

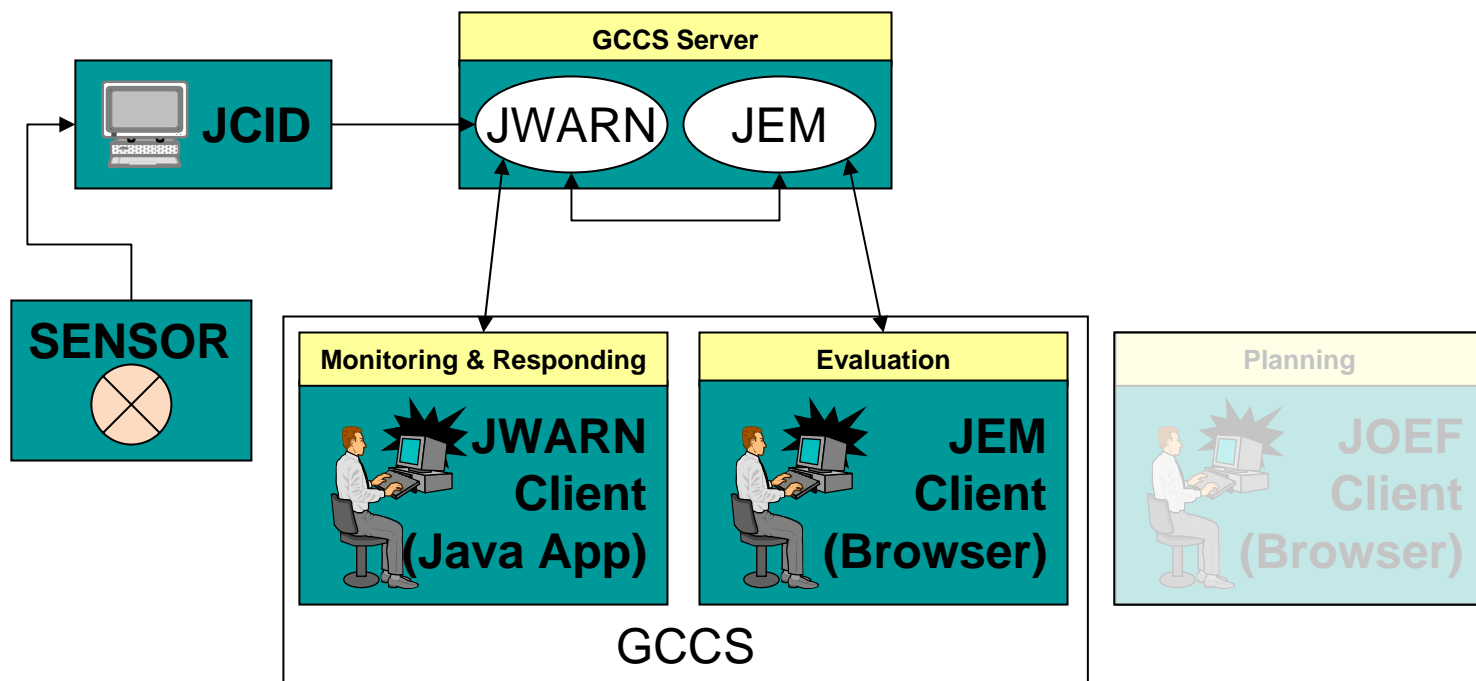
- Build the architecture framework for an integrated CBRN IS
- Ensure common standards for system interface requirements
- Manage data, sensor, and C4I interfaces
- Resolve issues and elevate them when necessary
- Oversee prototype engineering
- Coordinate with the SSA architectural staff
- Stay involved with the S&T efforts and transition of capabilities to meet CBRN requirements



Integrated Technical Team Sub-Groups

- **Integrated Architecture Development**
- **C4ISR Integration / Transition**
- **Data Model Implementation**
- **Environment Services**
- **HSI /GUI**
- **Information Assurance / Security**
- **System Performance**

Migration Strategy - Near Term Goal

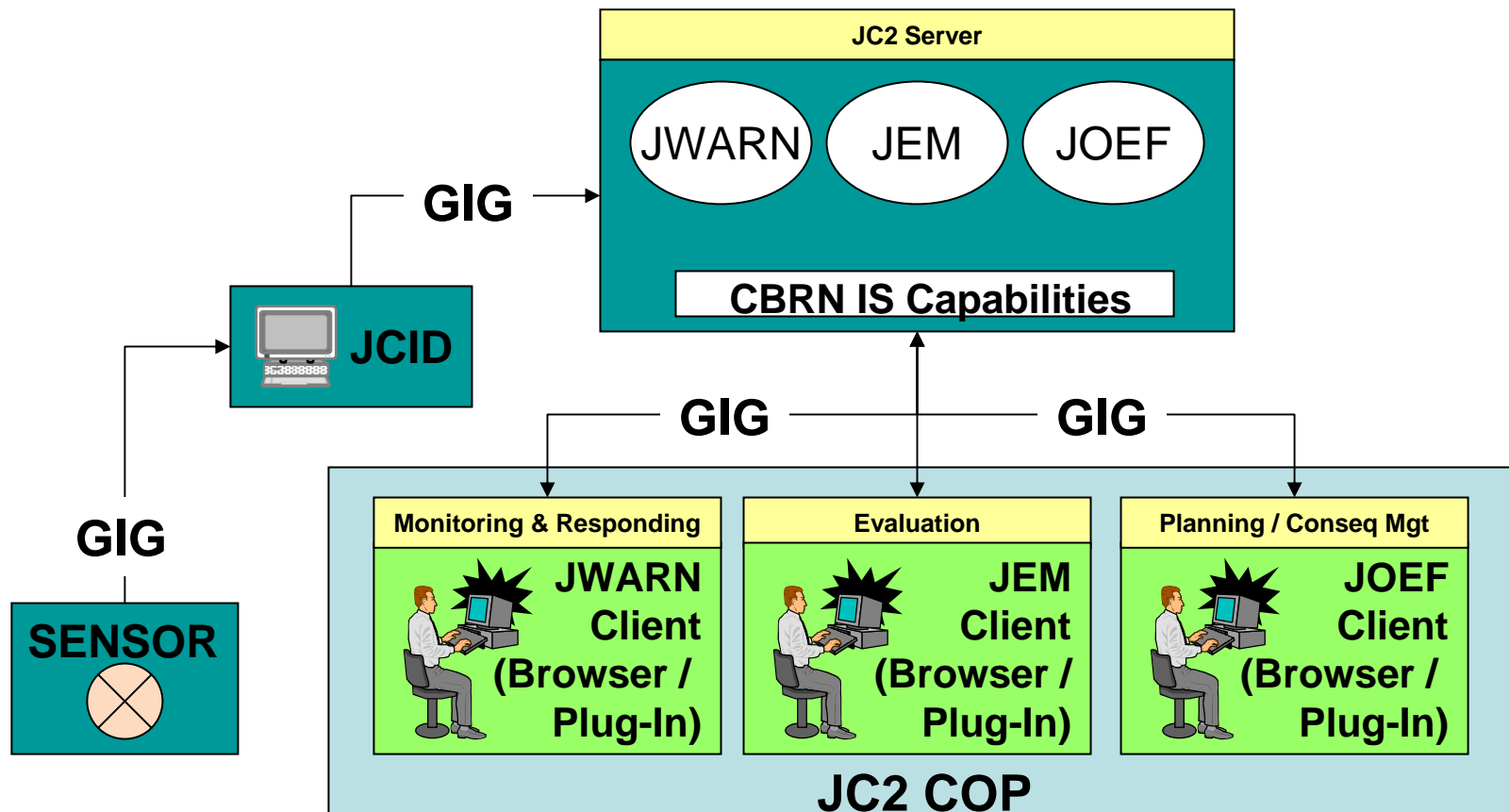


***BUILDING TO WHAT IS REQUIRED AND AVAILABLE NOW AND
PLANNING FOR THE FUTURE!***



Migration Strategy - Long Term

(NCES, JC2, Common Data Models, GIG, etc)

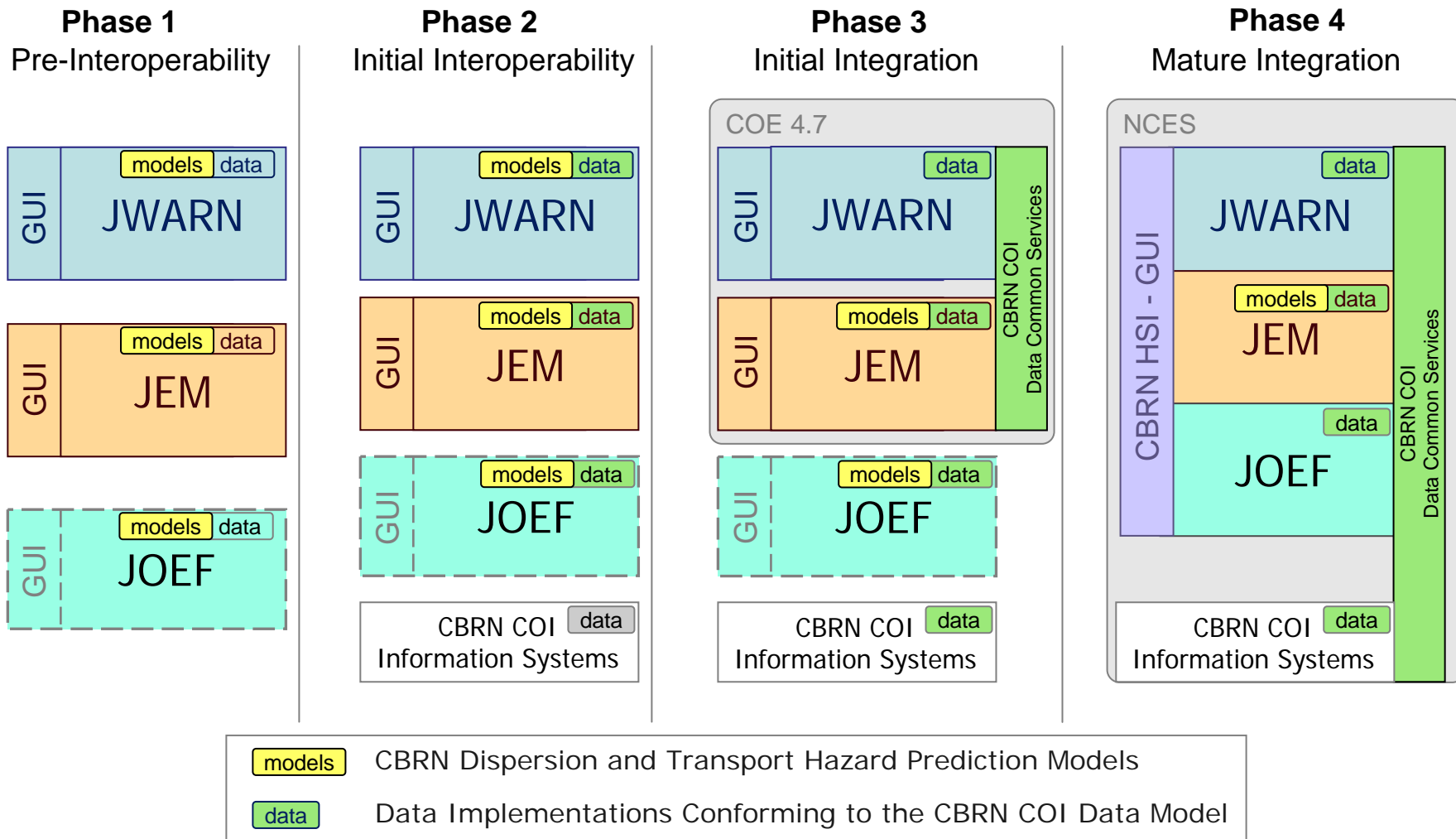


MIGRATION STRATEGY IN PLACE THAT ALIGNS WITH THE NET-CENTRIC WARFARE VISION!



Migration Strategy

Integration/Interoperability Path to NCES/JC2



JPM IS Matrix Organization and Enterprise wide SSA will support Interoperability and Integration of CBRN Core Service



JPM IS Integrated Architecture Status

- **Developed initial CBRN Data Model Implementation Schema**
- **JWARN/JEM Heuristic GUI Evaluation Completed by NGS / JPM IS**
- **Crafted Integrated Architecture Contract Language**
 - Provides service oriented architecture guidance
 - JPM IS internal staffing complete
 - SSA to staff to external stakeholder organizations
- **Normalizing JPM IS Architecture**
 - Aligned SV- 4s to CBRND OV-5 same level of abstraction
 - Others to follow, including data model integration
 - Supporting JWARN, JEM, JOEF architecture updates
 - Supporting updates to acquisition milestone documentation
- **Building the Integrated Architecture**
 - First spiral complete targeted Mar'06
 - Second spiral complete target Sep'06
- **Integrated Technical Team IPT Re-initiated**
 - Sub team leads identified
 - ITT meeting targeted 8-9 Nov'05

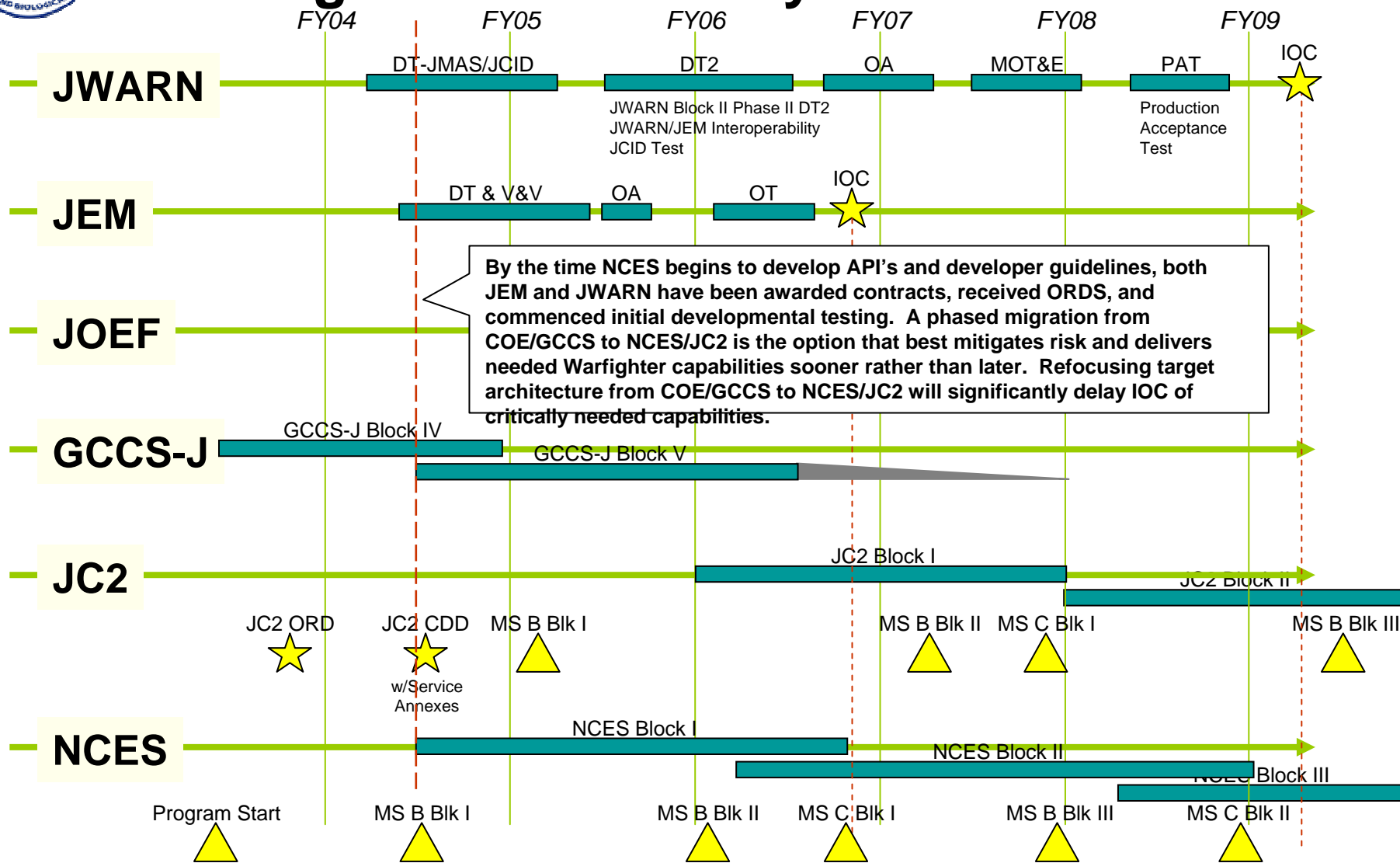


JPM IS IA Challenges





Program Schedule Synchronization



Capturing all C4I Systems SWB Strategies is a Challenge!!



JPM IS Architecture: Top Challenges

- **Staying abreast of 3 programs and the various issues is daunting**
- **Establishing and Maintaining C4I MOAs with Host Systems**
- **Synchronization of C4I host systems software release cycles**
- **Driving toward a common user interface**
- **Describing the Integrated Architecture to the software layer**
- **Transitioning Tech based capabilities**



Software Support Activity



SSA Vision

“The JPEO-CBD SSA is a comprehensive and cost effective single point of contact for users (Customers, Developers, and Warfighters) to receive professional and timely assistance with all CBRN Defense program standards, interoperability, and supportability needs to ultimately facilitate the creation of more efficient, common, and consistently superior interoperable and integrated CBRN systems for the Warfighter.”



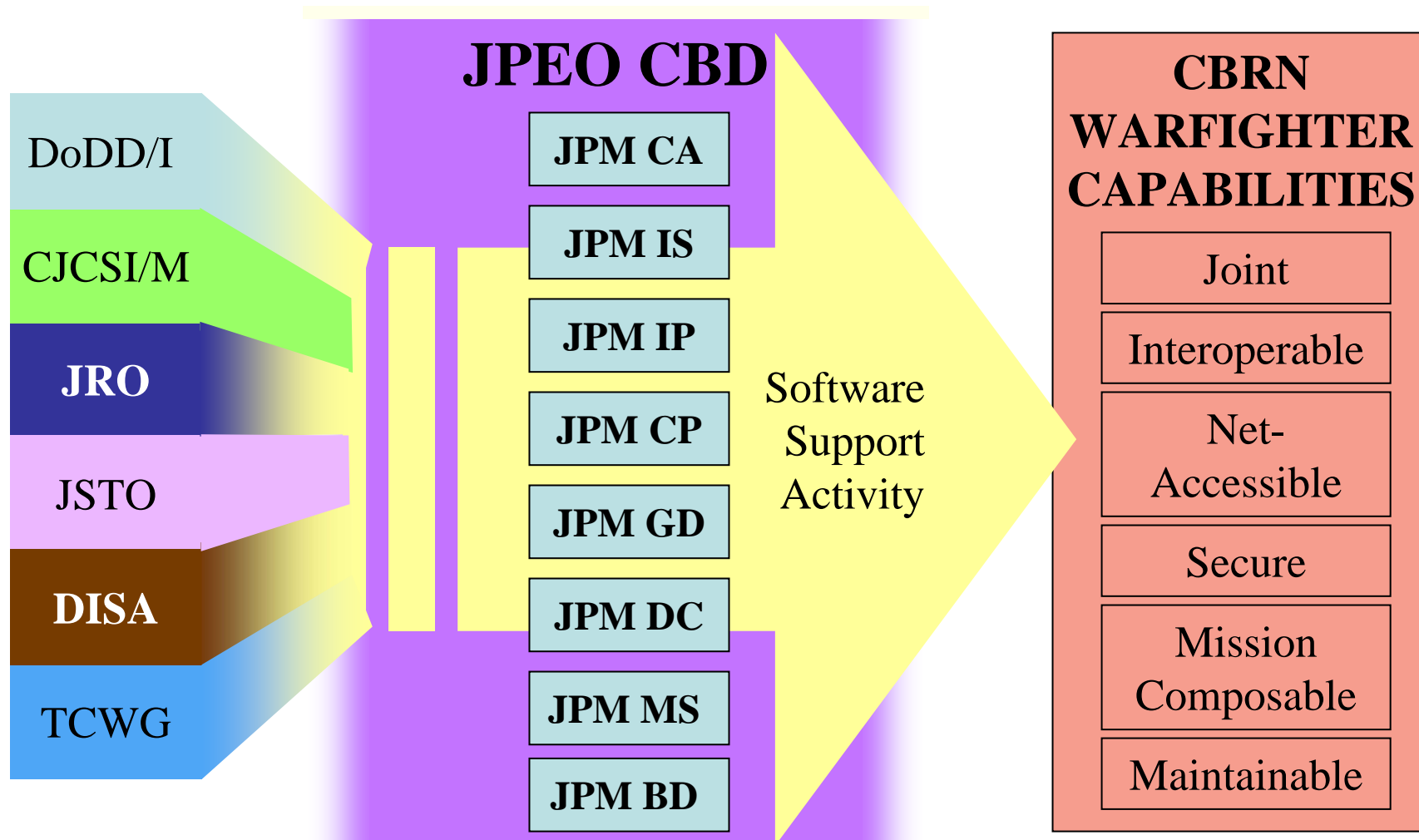
SSA Objectives

- Coordinate support and development of JPEO CBD Information Systems
- Creating and leveraging commonality across the Enterprise
 - Identifying duplication of effort in existing support activities
 - Making recommendations to support capabilities gaps
 - Directly develop or employ solutions to fill those gaps.
- Create a reusable Enterprise-wide Services framework that ties together and leverages the Software Support Facilities (SSFs) across JPMs

The SSA spans JPEO CBD



JPEO-CBD-SSA



SSA WORKS TO REALIZE, FOR THE WARFIGHTER, THE VISION OF NET-CENTRIC WARFARE FOR CBRN PROGRAMS OF RECORD



Capabilities Language for JRO-CBRND

- **Language for JRO-CBRND ICDs, CDDs, CPDs, ISPs:**
 - **CBRN Programs of Record, and S&T activities shall comply with the following:**
 - **Information Exchanges shall utilize, and extend as necessary, the DoD's CBRN COI Logical Data Model.**
 - **Information storage shall utilize, and extend as necessary, the physical specification of DoD's CBRN COI Data Model.**
 - **Information shall be discoverable and shall have an authoritative source.**
 - **CBRN Test activities shall verify and validate all CBRN information exchanges and storage against the DoD's CBRN COI Data Model.**

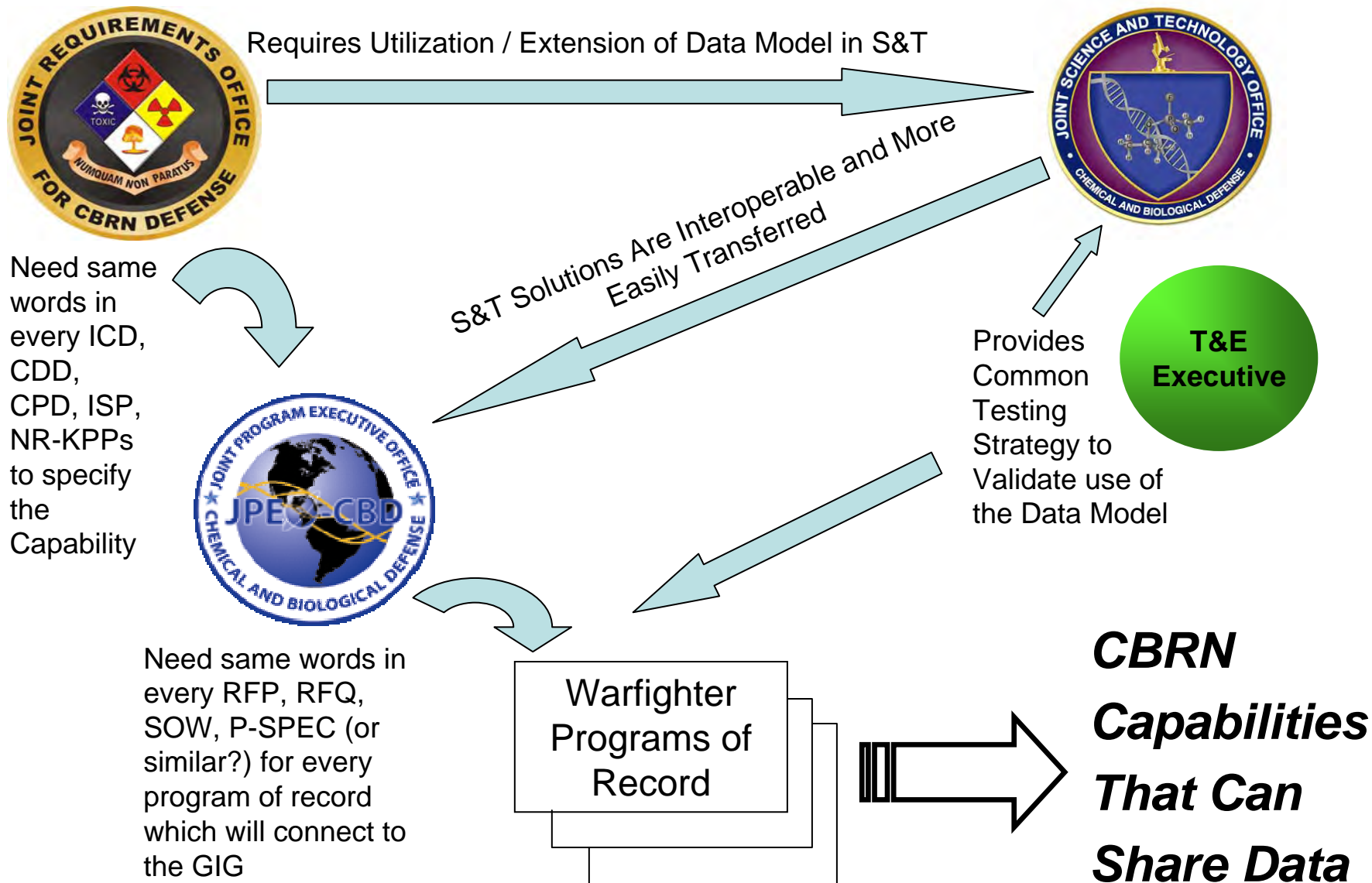


How CBRN Data Complies with COE

- **Data Interoperability**
 - The CBRN Data Model is a key enabler of data interoperability because it provides a vehicle to describe and enforce shared semantics and syntax
 - CBRN Data will not duplicate common data-- a key COE/GCCS requirement for data
- **Data Segmentation**
 - CBRN Data will be separated from the applications (JWARN/JEM/JOEF), as required by COE
 - CBRN Data will not need to have application segments installed on the database server (expressly disallowed by COE)



Requiring CBRN Data for all “M” Systems Which Transmit, Receive, or Store, CBRN Data and/or Connect to the GIG Across the CBDP



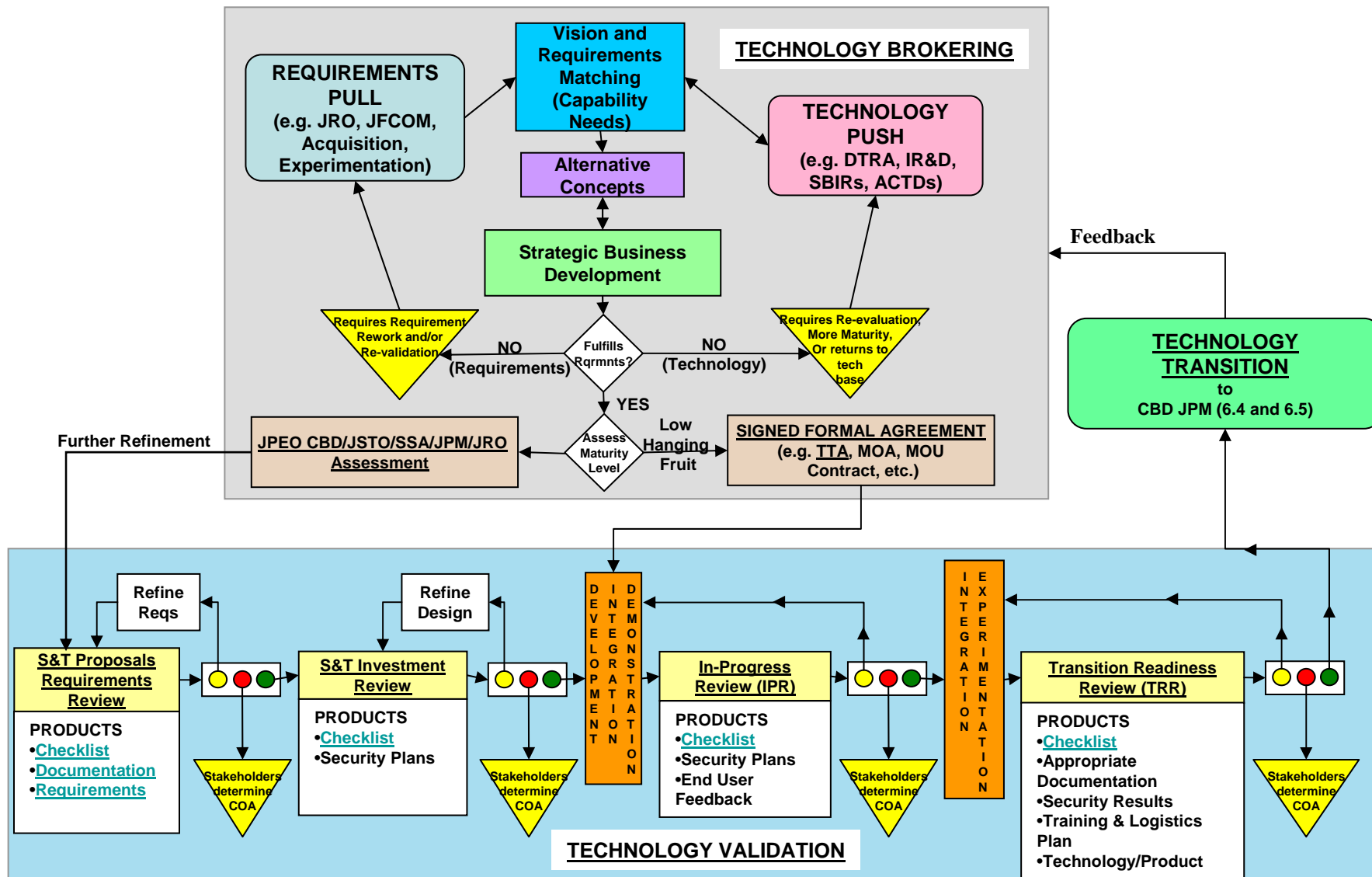


The JIC Prototype

- **Support early warfighter involvement with JWARN, JEM, JOEF technology**
- **Support user interface requirements**
- **Support technical demonstrations and experiments**
- **Support early integration and data management of an integrated system**
- **Generate operational feedback to JWARN developer**
- **User assessments**
- **Provide a venue to validate and refine MOP's and MOE's**
- **Provide an opportunity to refine service Concept of Operations (CONOPS) and Tactics Techniques and Procedures (TTP's)**
- **Provide a fully functional end to end capability for services to operationally employ if an urgent need arises**



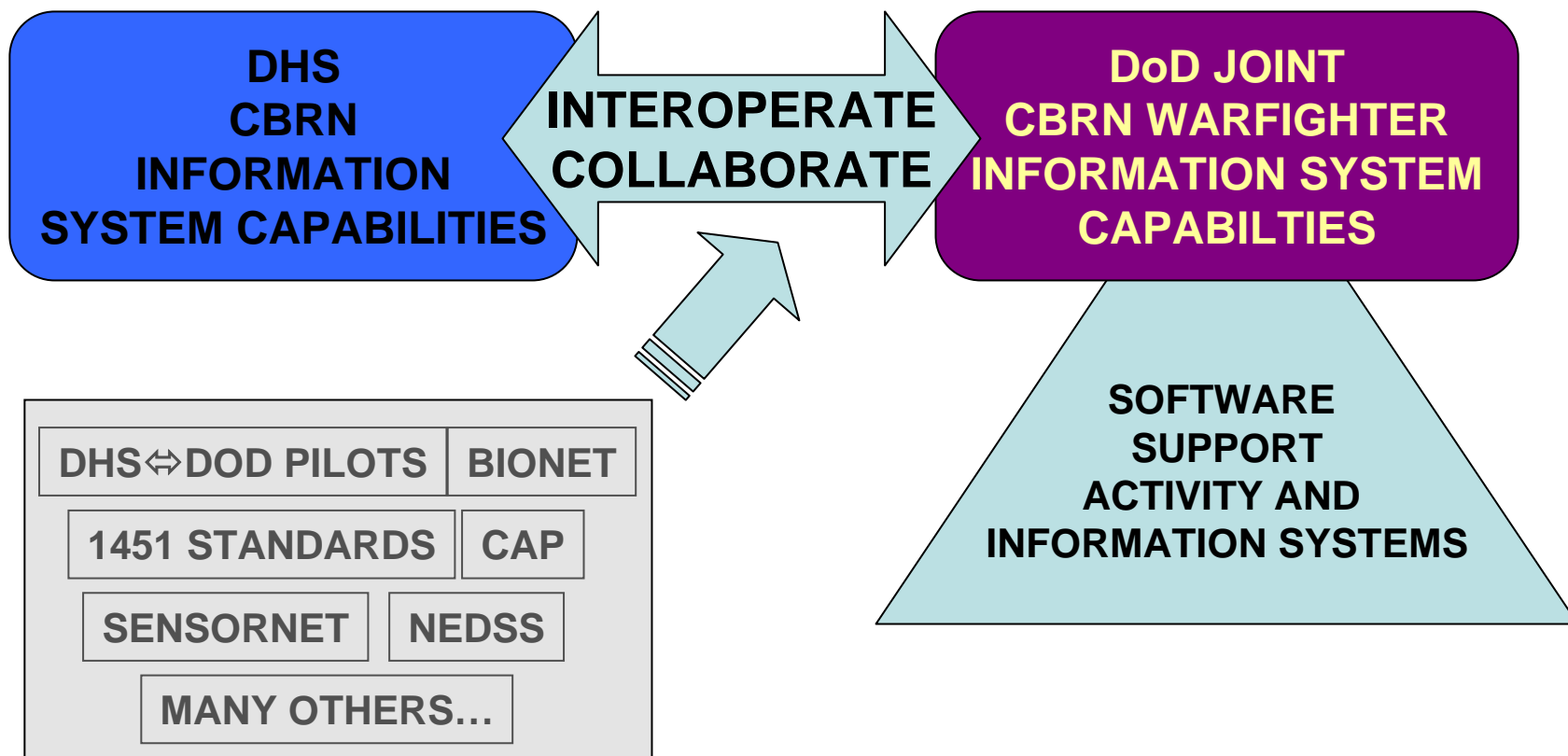
CBRN PROCESS for IS S&T INSERTION



DOCUMENTS/INFORMATION SHAPED THROUGHOUT LIFECYCLE OF THE TRANSITION PROCESS:
CONOPS, Risk Mitigation Plan, Technology Transition Agreement (TTA), POM Inputs, Exit Criteria, Functional/Operational Requirements



JPM IS – (DHS Focus) WAY AHEAD



**JPM IS - FOCAL POINT FOR THE FUTURE THAT BRIDGES AND ALIGNS
DoD CBRN INFORMATION SYSEMS WITH DHS CBRN INFORMATION
SYSTEMS MEET THE NATIONAL SECURITY STRATEGY OF GREATER
SHARED INTELLIGENCE AND SUPERIORITY!**



Science and Technology Conference for Chem-Bio Information Systems

**Joint Requirements Office for Chemical, Biological,
Radiological, and Nuclear Defense**

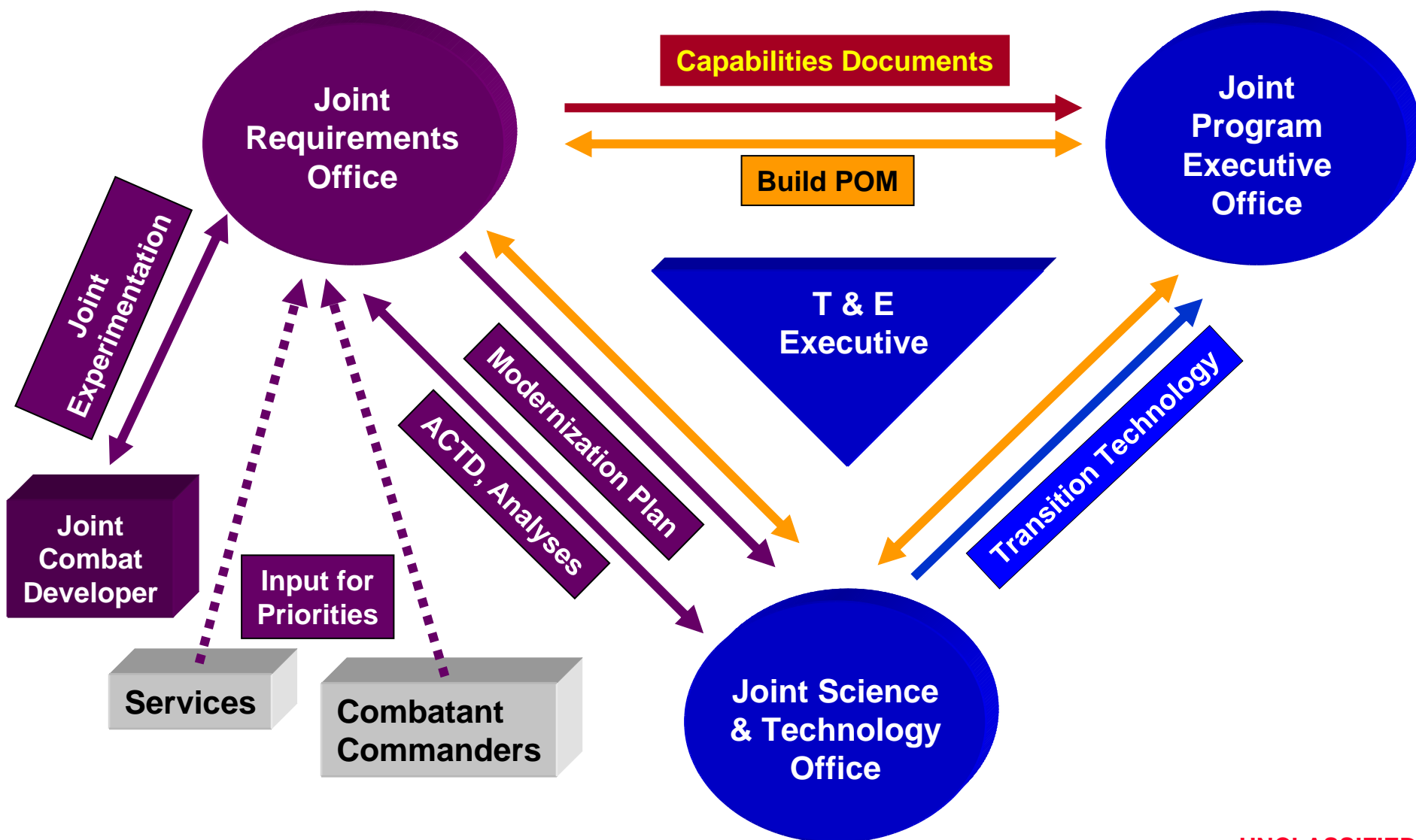
(JRO for CBRND)

24-28 October 2005

JRO – CBRN Defense Charter

- **Single office within DOD responsible for the planning, coordination, and oversight of joint CBRN defense operational requirements**
 - **Develop and maintain the CBRN Defense Integrating Concept and the CBRND Modernization Plan**
 - **Represent the Services and Combatant Commanders in the requirements generation process and act as their proponent for coordinating and integrating CBRND operational capabilities**
 - **Develop DOD CBD POM with acquisition community support**
 - **Facilitate the development of joint doctrine and training and sponsor the development of multi-service doctrine**
- **CJCS' single source of expertise to address all issues involving CBRND, within passive defense, consequence management, force protection, and homeland security**

Required Capabilities, S&T, and Acquisition

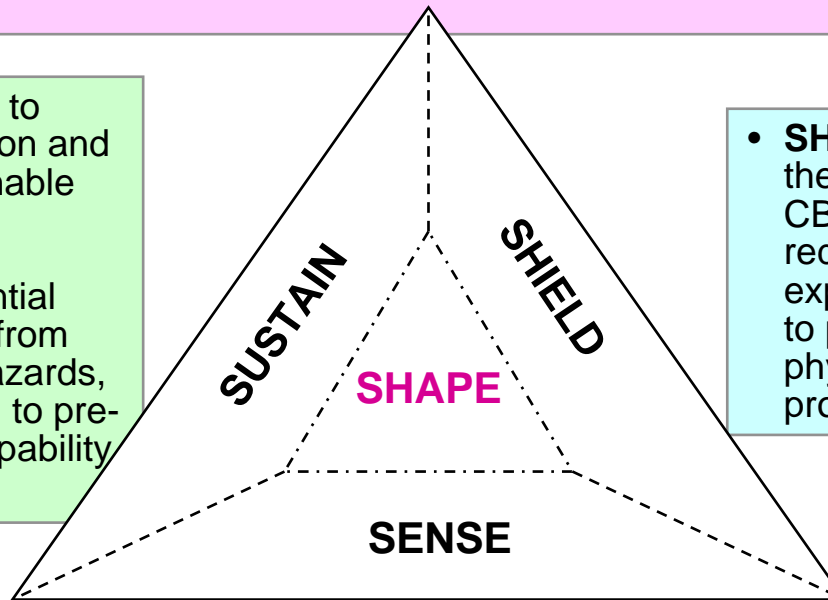


Joint CBRN Defense Functional Concept

- **SHAPE** – Provides the ability to characterize the CBRN hazard to the force commander - develop a clear understanding of the current and predicted CBRN situation; collect and assimilate info from sensors, intelligence, medical, etc., in near real time to inform personnel, provide actual and potential impacts of CBRN hazards; envision critical SENSE, SHIELD and SUSTAIN end states (preparation for operations); visualize the sequence of events that moves the force from its current state to those end states.

- **SUSTAIN** – The ability to conduct decontamination and medical actions that enable the quick restoration of combat power, maintain/recover essential functions that are free from the effects of CBRN hazards, and facilitate the return to pre-incident operational capability as soon as possible.

- **SHIELD** – The capability to shield the force from harm caused by CBRN hazards by preventing or reducing individual and collective exposures, applying prophylaxis to prevent or mitigate negative physiological effects, and protecting critical equipment



- **SENSE** – The capability to continually provide the information about the CBRN situation at a time and place by detecting, identifying, and quantifying CBRN hazards in air, water, on land, on personnel, equipment or facilities. This capability includes detecting, identifying, and quantifying those CBRN hazards in all physical states (solid, liquid, gas).

Executing the CBRND Concept

Protection Functional Concept

- Detect Hostile Efforts
- Predict Adversarial COAs
- Warn the Joint Force
- Prevent Adverse Effects
- Defend Against Adverse Effects
- Recover Without Critical Losses

CBRND Enabling Concept

- Sense the Hazard
- Shape the Battlespace
- Shield the Force
- Sustain the Force

Implementing the Concept

- Stand-off Detectors
- Point Detectors
- NBC Reconnaissance
- JWARN
- JEM/JOEF
- Command and Control Systems
- Protective suits and masks
- Medical pretreatments
- Collective protection
- Decon systems
- Medical diagnosis
- Medical post-treatments

Overall Objective: Fully integrated CBRN Defense capabilities that enable the Joint Force to minimize risk to personnel

SHAPE Capability Gaps

Findings from 2003 CBRND Baseline Capability Assessment (BCA):

- Limited common database to facilitate advanced development due to lack of funding applied in SHAPE S&T and developmental programs
- Lack of sustained development for advanced CBRN modeling and simulation to support all requirements

Integrated Early Warning

- Limited ability to provide selective alarming
- Limited sensor interface
- Limited interoperability restricts improved output generation

Battlespace Management

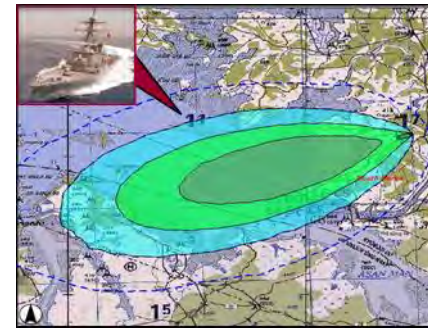
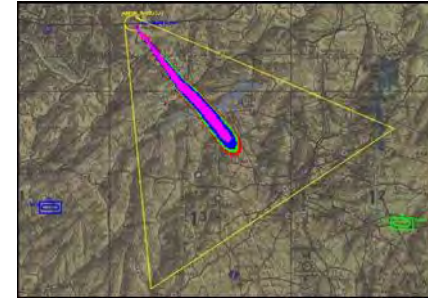
- Lack of automated planning tools and decision aids
- Limited interface with COP

Battlespace Analysis

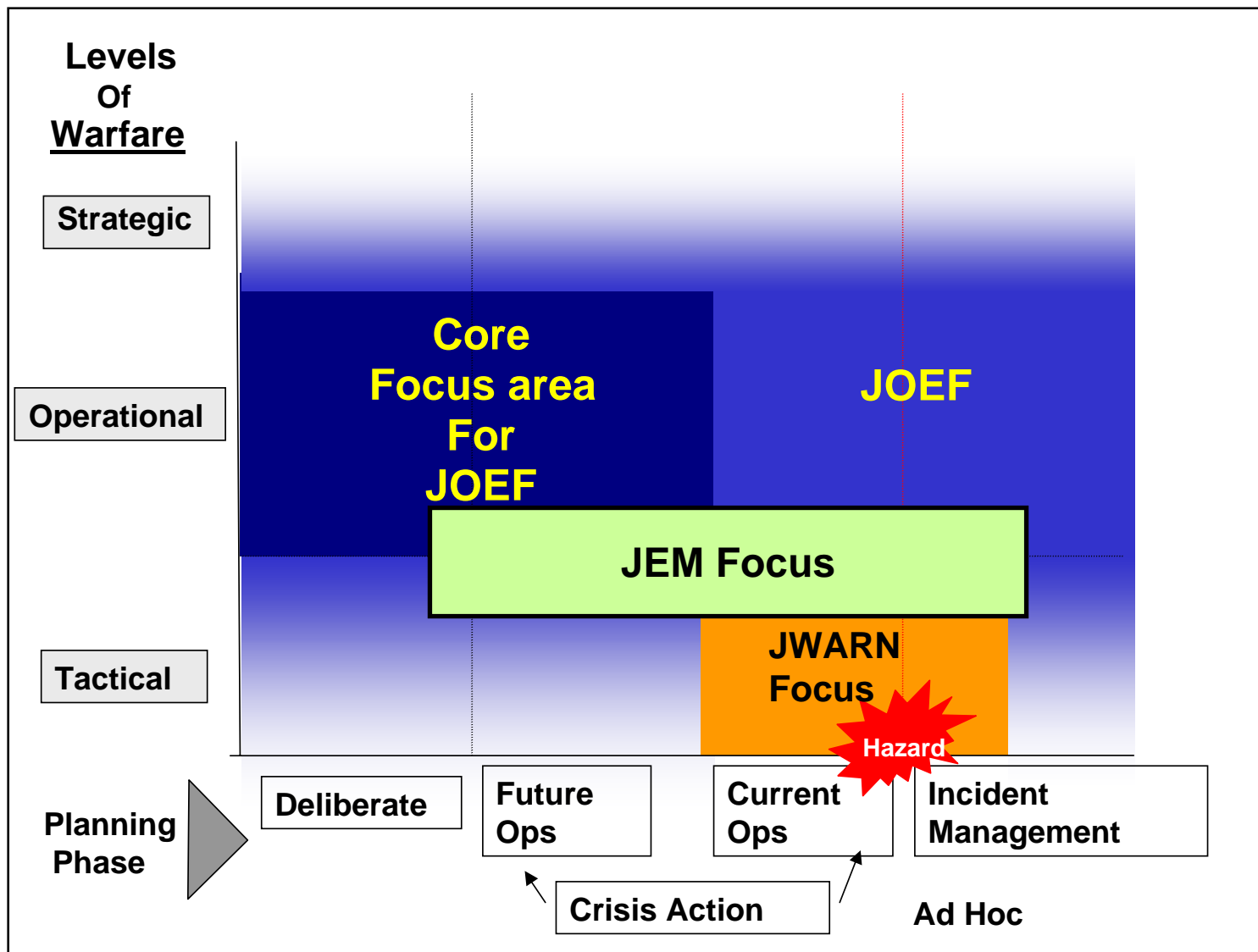
- Limited algorithms to accurately predict and assess hazard
- Limited compatibility of current developmental system
- Lack of integrated medical and non-medical analysis capability

CBIS FoS Synchronization

- JWARN will provide basic early warning hazard prediction and reporting capability
- Joint Effects Model (JEM) will provide enhanced situational awareness of the battlespace, with real-time hazard information to influence current operations and minimize affect to OPTEMPO
- Joint Operational Effects Federation (JOEF) will provide vulnerability assessments and Course of Action recommendations (considering CBRN effects), estimate Logistical requirements (including medical), and will deliver OPLAN CBRN annexes and staff estimates (Deliberate Planning)



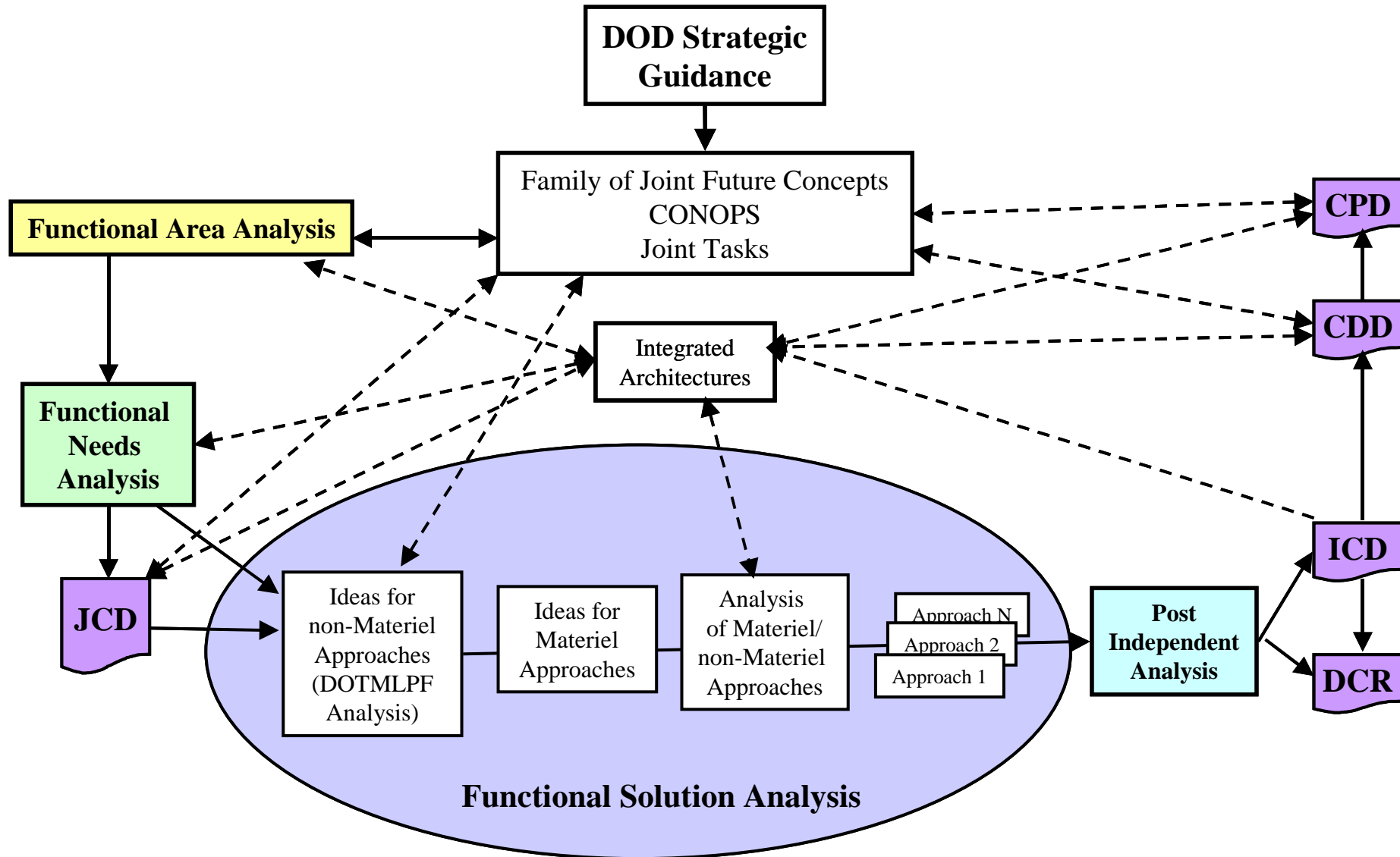
JOEF, JWARN and JEM Applications

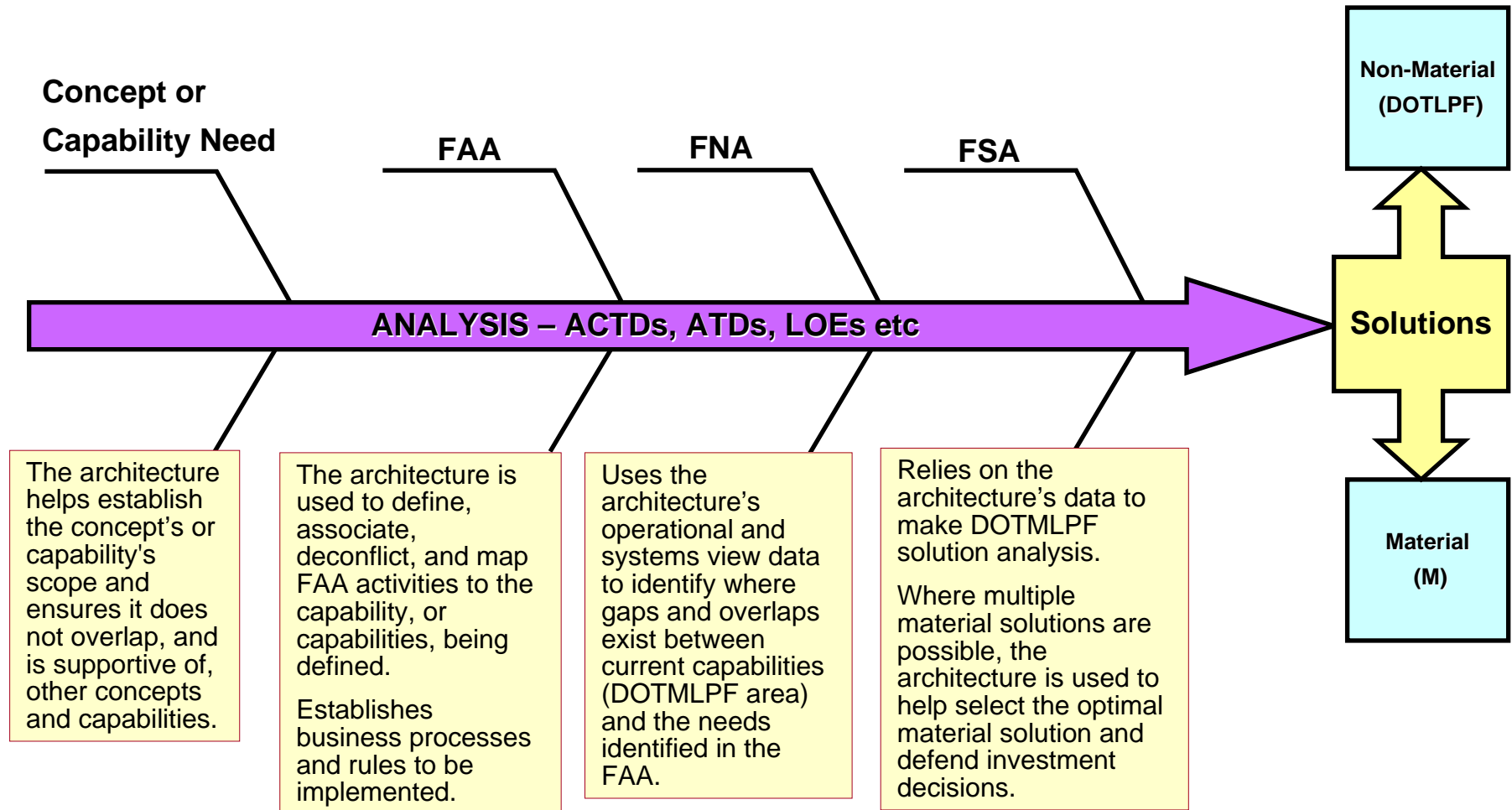


Looking Beyond JWARN, JEM, and JOEF

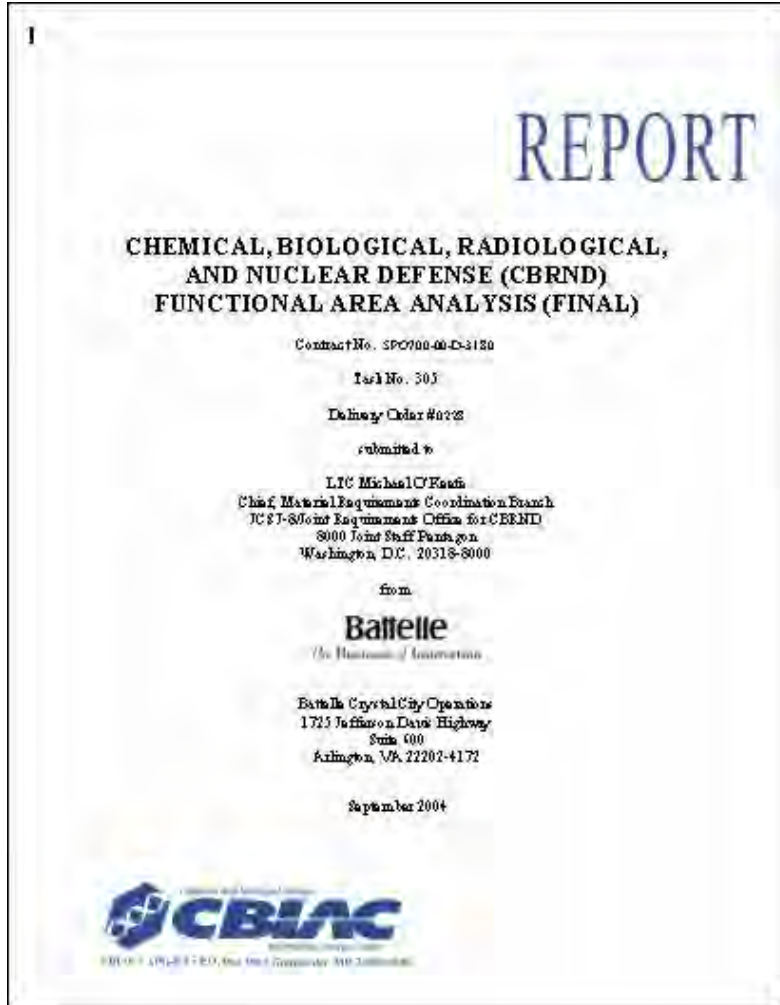


- **Joint Capability Integration and Development System**
- **Supporting Analyses**
- **Gap Identification**

(Joint Capabilities Integration and Development System)

Using Architecture to Support JCIDS

FNA/FSA developed from the CBRND FAA



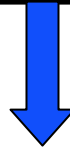
244 CBRND Tasks

- Focused on Passive Defense
- Task Definitions
- Measures of Effectiveness
- Conditions

CBRND FAA Task Structure

Number of Tasks Identified By CBRND Operational “S” Areas and Levels

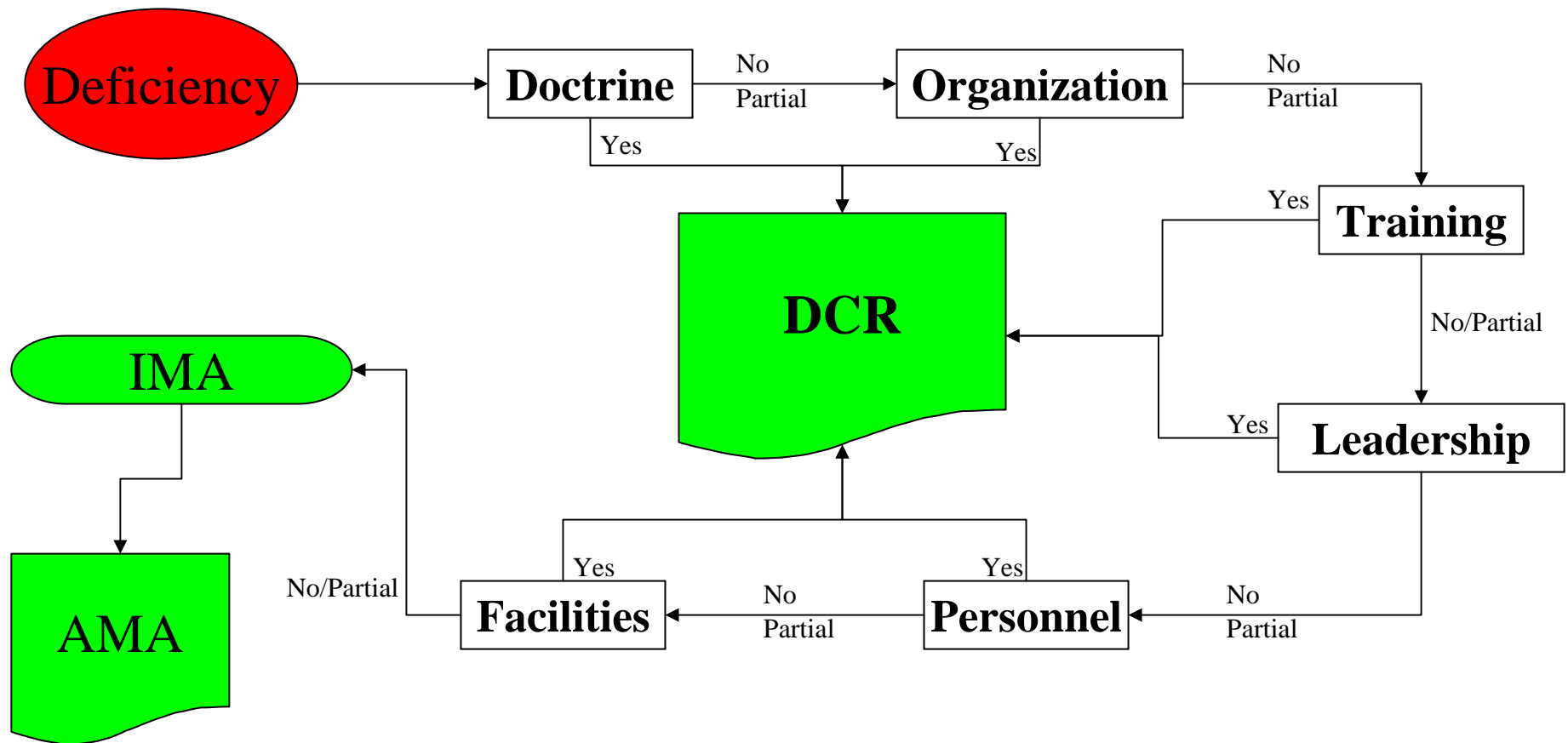
	Sense	Shape	Shield	Sustain
National (SN)	17	14	12	12
Theater (ST)	9	11	11	14
Operational(OP)	10	12	14	14
Tactical (TA)	17	32	14	31



Total of 69 Tasks (from FAA) assessed for Shape

DOTLPF Recommendations

Once a Capability Gap is exposed, the primary means to address that is gap is through the DOTLPF analysis.

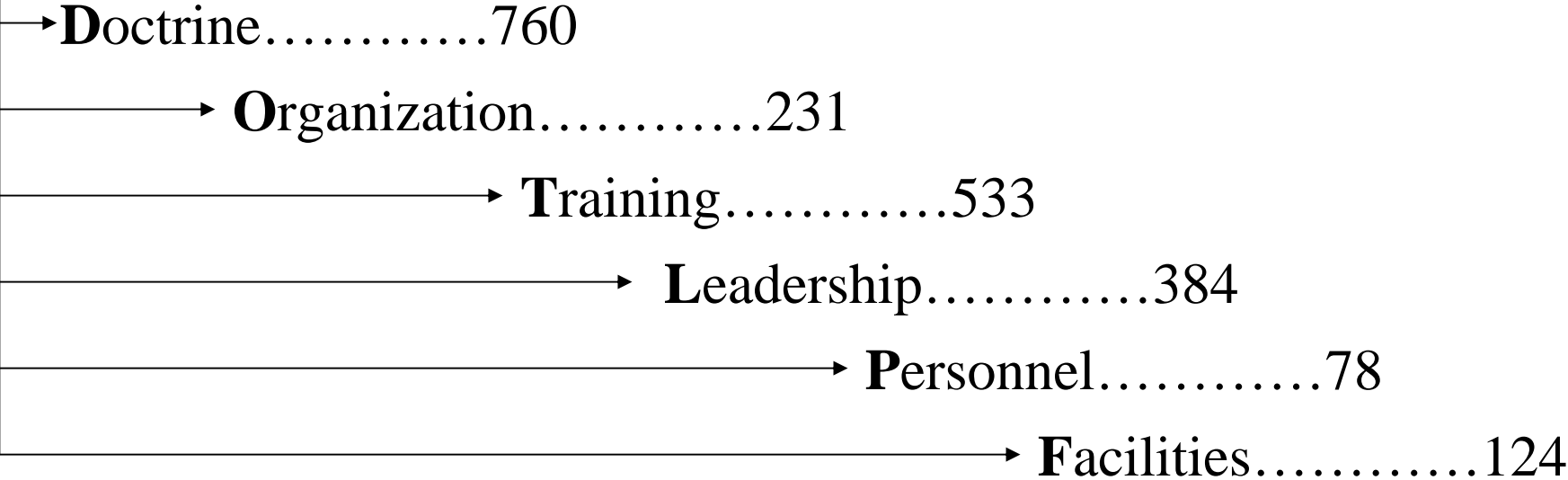


Summary of Gaps and Recommended Solutions


1525 DOTLPF based Deficiencies




2110 Recommendations




SN SHAPE Gaps

- 
- Expertise/ training/ education of CBRN personnel within DOD
 - Detection policies dependent upon global system linkages
 - Addressing issues above the operational level of war

ST SHAPE Gaps

- 
- JTTPs and tools to evaluate and assess CBRND staffs, capabilities, systems, and concepts are limited
 - Vulnerability assessment tools conducted manually on a region-by-region basis are limited
 - Deficiency in coordination of CBRN information networks.

OP SHAPE Gaps

- 
- Intelligence data and products that ensure a robust CBRN IPB are limited.
 - CBRND logistics complex and constrained
 - Planning for CBRN Active Defense, Interdiction, and Elimination is limited
 - Deficiency in coordination of CBRN information networks

TA SHAPE Gaps

- **Current CBRN/TIM release, reporting, analyzing, and warning TTPs and material solutions do not have adequate response times and do not provide high resolution information.**
- **Current doctrine and training includes the tools necessary to conduct CBRN – related IPB and manage CBRN aspects of the battlespace. However, current tools and TTPs limit full capability**

- Complete integration of information, regardless of source
- Embedded information management capabilities
- Embedded sensors
- “Plug and Play” capabilities

Is there a CBRN IPOD waiting to change the way we do business?



Contact Information

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Operational Effect Thrust Area



Mr. Mark Fagan, OETA Manager

October 2005



Overview



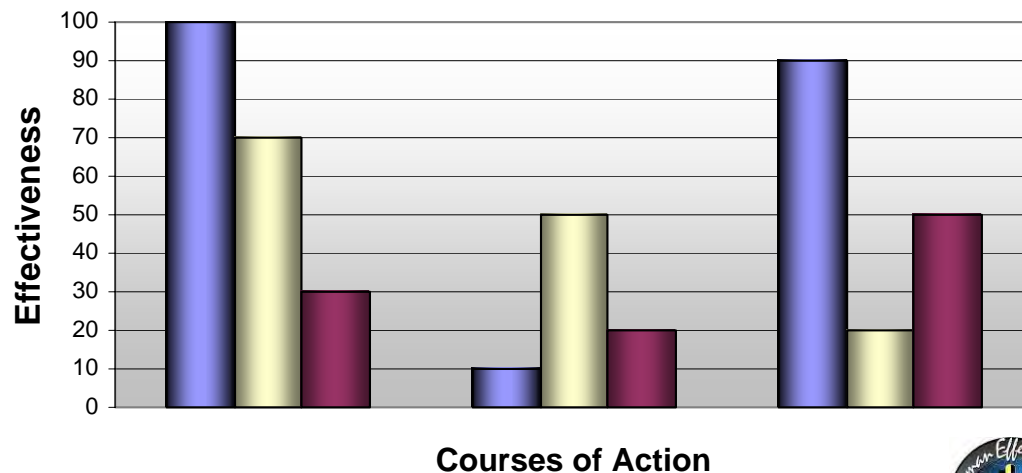
- **Mission statement**
- **Objectives & strategy**
- **Scientific approach**
- **Current efforts**
- **Accomplishments & status**
- **Challenges**
- **Conclusion**



Provide Combat Commanders & Services with Modeling, Simulation and Analysis (MS&A) tools to quantify and assess the ops effects & risks of a CBR attack

- Courses of Action can be evaluated to determine best action available to commander
- Ops Effects Measures Of Effectiveness include, but are not limited to:
 - Mobile force movement
 - Casualty streams
 - Impact on medical support
 - Sortie generation rates
 - Cargo throughput
 - Logistics impacts

Commander's Trade-offs





Objectives



- **Build on current programs that have demonstrated progress and success in meeting needs and requirements**
 - Deliver a mix of short term transitional products
 - Continue work on long term technologies
 - Develop new performers
- **Improve capabilities to rapidly assess operational effects on mobile forces and new threat domains**
- **Use of scientific and technological capabilities of civilian contractors and DoD personnel and facilities to max extent possible: Build the infrastructure**





Strategy

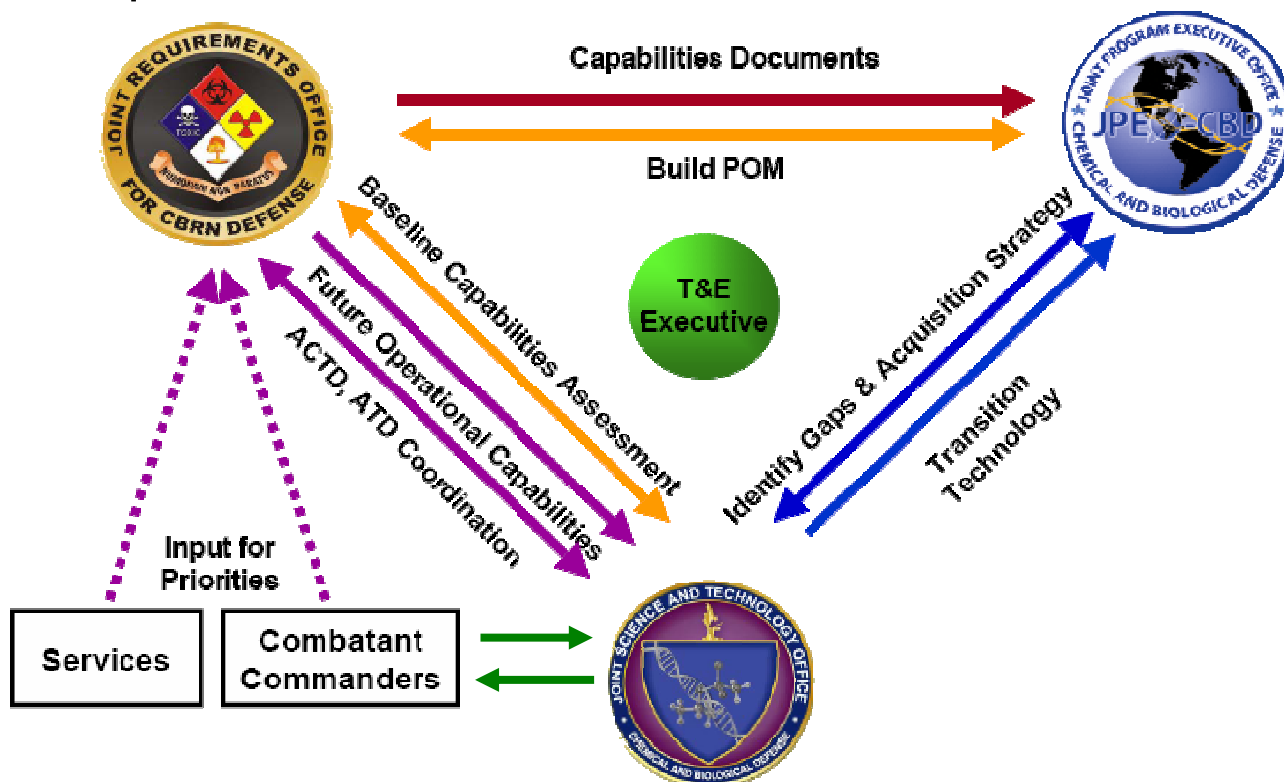


- **To max extent possible, efforts leverage related tasks/programs, i.e., JEM, JOEF, Congressionals, etc.**
- **Close coordination with the CBR defense acquisition community is maintained to assure transition to applicable acquisition program**
- **Provides a flexible framework to:**
 - **Incorporate documented requirements**
 - **Respond to new technology and threats**
 - **Assess the current status of M&S development**
 - **Provide capability to propose paths for future efforts**



Scientific Approach – User Input

- JRO provides JSTO “high-level” requirements
- JSTO must go directly to services and Combatant Commanders for more detailed requirements and feedback



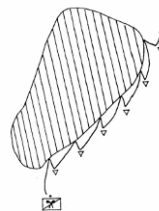
Build the appropriate tools for the appropriate users

Scientific Approach – Technology Selection

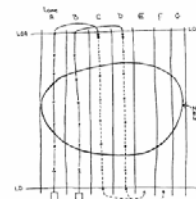
- Numerous technologies, techniques and environments can be selected when approaching a problem

- Database technologies
 - Extended Markup Language (XML)
- Task networks
- Intelligent agents
- Discrete simulation
- System simulation
- Pattern recognition & search algorithms
- Data converters
- Output post-processors
- Programming Languages
- GIS interfaces
- Data models
- Hardware platforms
- Software communication architectures
- Genetic algorithms
- 3D Viewers
- Many, many more

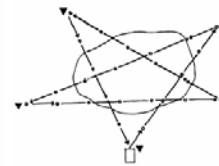
Differing NBC Search Techniques



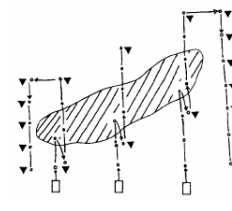
Standard



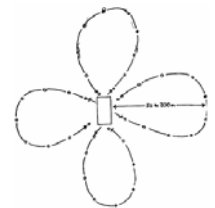
Lane



Star



Near / Far Side



Clover-leaf

Select the technologies that best address the problem

Scientific Approach – Implementation

- **S&T communities will be surveyed for existing programs that meet user needs.**
 - Where programs exist that meet user needs, these programs will be identified for transition to JPEO
 - Where technologies exist but in disparate programs, integration work will bring the programs together
 - Where no program exists, the S&T community will develop to meet user needs
- **Hard decision trade-offs must be made due to funding and time of development constraints**
- **Configuration Management is key to repeatability and accountability**



Build only when existing technology is insufficient



Scientific Approach – Testing and Documentation



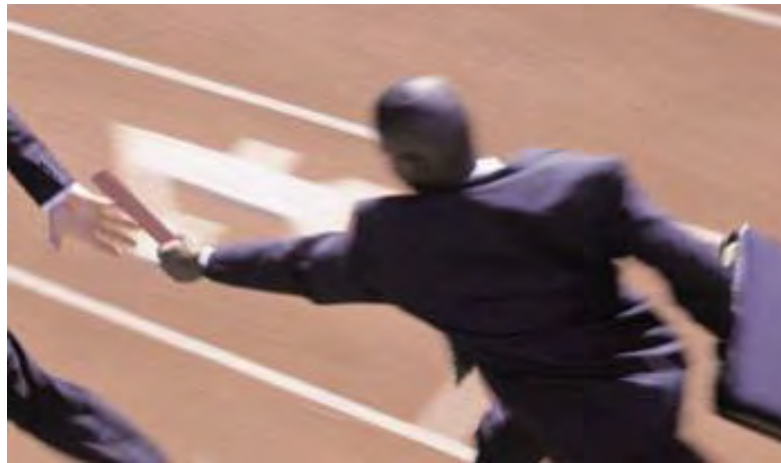
- **Critical to producing products that transition effectively**
- **Limited funds focus efforts on areas of most benefit for least cost**
- **Testing performed and documentation written through-out product development**
 - **Verification tests performed at code, subsystem, system, and installation levels**
 - **Internal and external validation tests performed on most-common and highest sensitivity cases**

**Testing and documentation supports future
acquisition program efforts**



Scientific Approach – Transitioning

- **Technology Transition Agreements (TTAs) written between S&T community and programs of record**
- **Transitions supported by documentation, testing, and consulting where required**
- **Not all S&T programs will be utilized in a final acquisition program product – some advanced and high risk R&D will fail**



Transitions are facilitated by consistent, regular discussion between S&T and Acquisition programs



Current Efforts – Modeling & Simulation

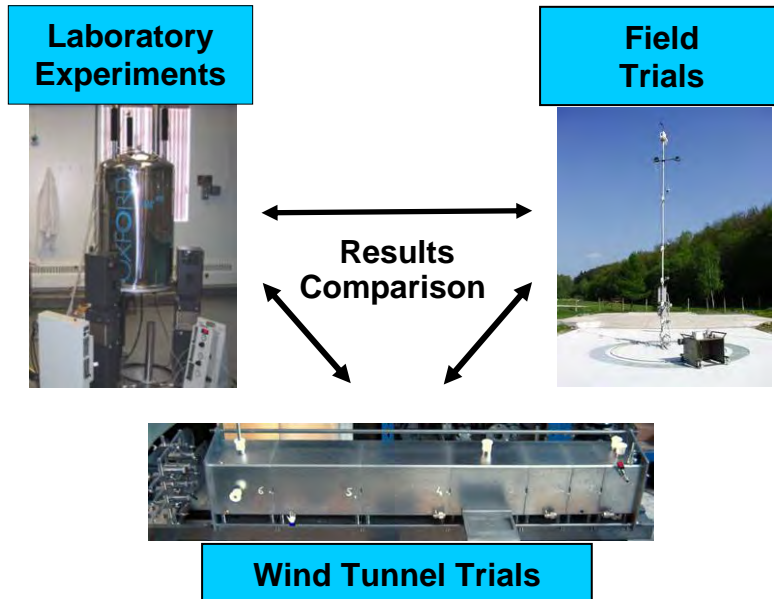


- **Fundamental Research**
 - Exploring emergent behaviors modeling and other non-traditional techniques for modeling asymmetric warfare
- **New Threat and Operational Domains**
 - TICs/TIMs and radiological Ops Effects modeling
 - Mobile Forces including various applications from tactical to the strategic modeling
- **Customized user-oriented tool development**
 - Creating tools that answer specific and focused warfighter requirements



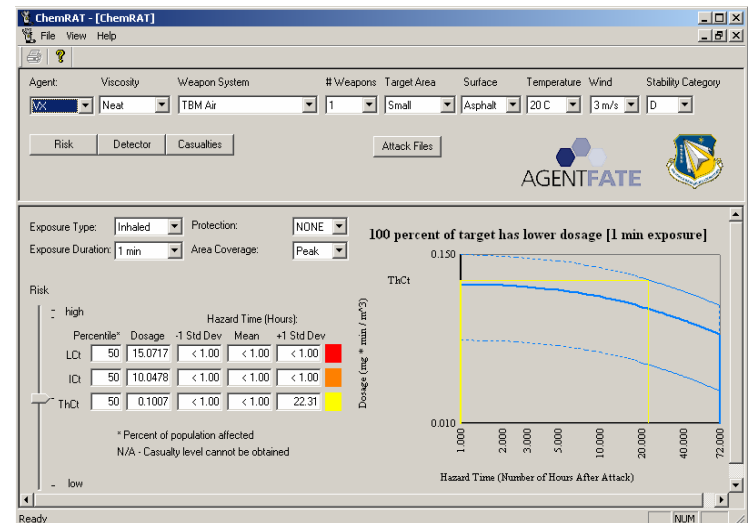
Current Efforts – Agent Fate

Live Experimentation



Data collected on real agent in various controlled and natural conditions

Predicative Modeling



Models and methods used to quantify and characterize hazard and associated risk

Mission: Improve prediction of CWA secondary evaporation and liquid contact & pickup



Current Efforts – University Collaboration



- **Kettering University**
 - Verification and validation authority working on Agent Fate efforts
- **University of New Mexico & New Mexico State University**
 - Creating decision support tools for allocation of resources
- **University of Oklahoma**
 - Advancing technology in: threat characterization, consequence management, behavioral dynamics and biomedical applications



**University collaborations often leverage
congressional set-asides to produce results**





Accomplishments & Status



- **STAFFS 2.0 & CHEMRAT 1.5 technology transition on schedule for November JOEF Milestone B decision**
 - Future CBD S&T modeling products will follow a similar paradigm transition to programs of record
- **Next Generation Modeling focus on mobile forces -- JOEF**
 - Exploring CB methodologies with existing technology base
- **CHEMRAT II uncertainty representation -- JOEF/JEM**
- **Work with DSTL on linking methodologies -- JOEF/JEM**
- **Planned work with NAVSEA (Dahlgren) on translating methodologies of “CB hardening for buildings and structures” to fixed site operational effects – JOEF**



Challenges



- **Balancing the vastly different user's requirements**
- **Software integration complexity and scope**
- **Applicability and maturity of existing radiological info/tools to ops effects over time is unknown**
- **Data fidelity, adequacy, and currency**
- **Collaboration of international agencies for Agent Fate testing**
- **Software validation and verification**

Conclusion

There will be technical and managerial challenges but none that can not be overcome through collaboration, cooperation and the strength of our scientific community.





Conclusion (cont)



- Questions?
- POC: **Mr. Mark Fagan; CB Program Manager**
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CB Defense Physical Science & Technology Division Modeling & Simulation / Battlespace

**Mr. Chuck Fromer
Joint Science and Technology Office for
Chemical and Biological Defense (JSTO-CBD)**

October 25, 2005



Making the World Safer



Modeling & Simulation / Battlespace Outline

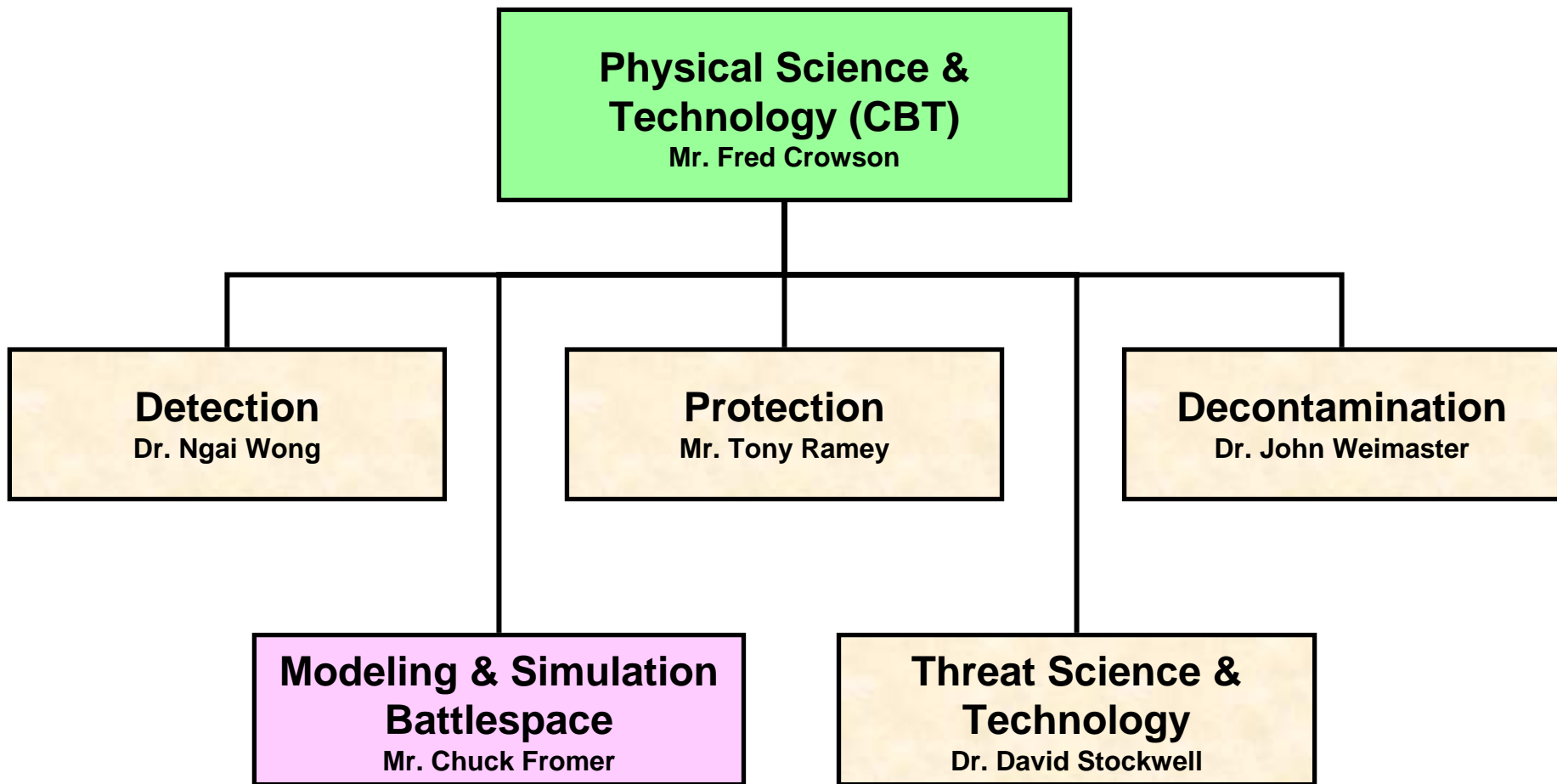


- **2005 Taxonomy**
- **2006 Taxonomy**
- **S&T Program Methodology**
- **Changes for 2006**
- **Technology Transition Agreements (TTA) Focus**
- **Technology Push Initiatives**
- **The Team**





Modeling & Simulation / Battlespace Physical Science & Technology (CBT) Structure





Modeling & Simulation / Battlespace Joint Structure



Capabilities Documents

Build POM

T&E
Executive

Baseline Capabilities Assessment

Future Operational Capabilities
ACTD, ATD Coordination

Identify Gaps & Acquisition Strategy

Transition
Technology

Input for
Priorities

Services

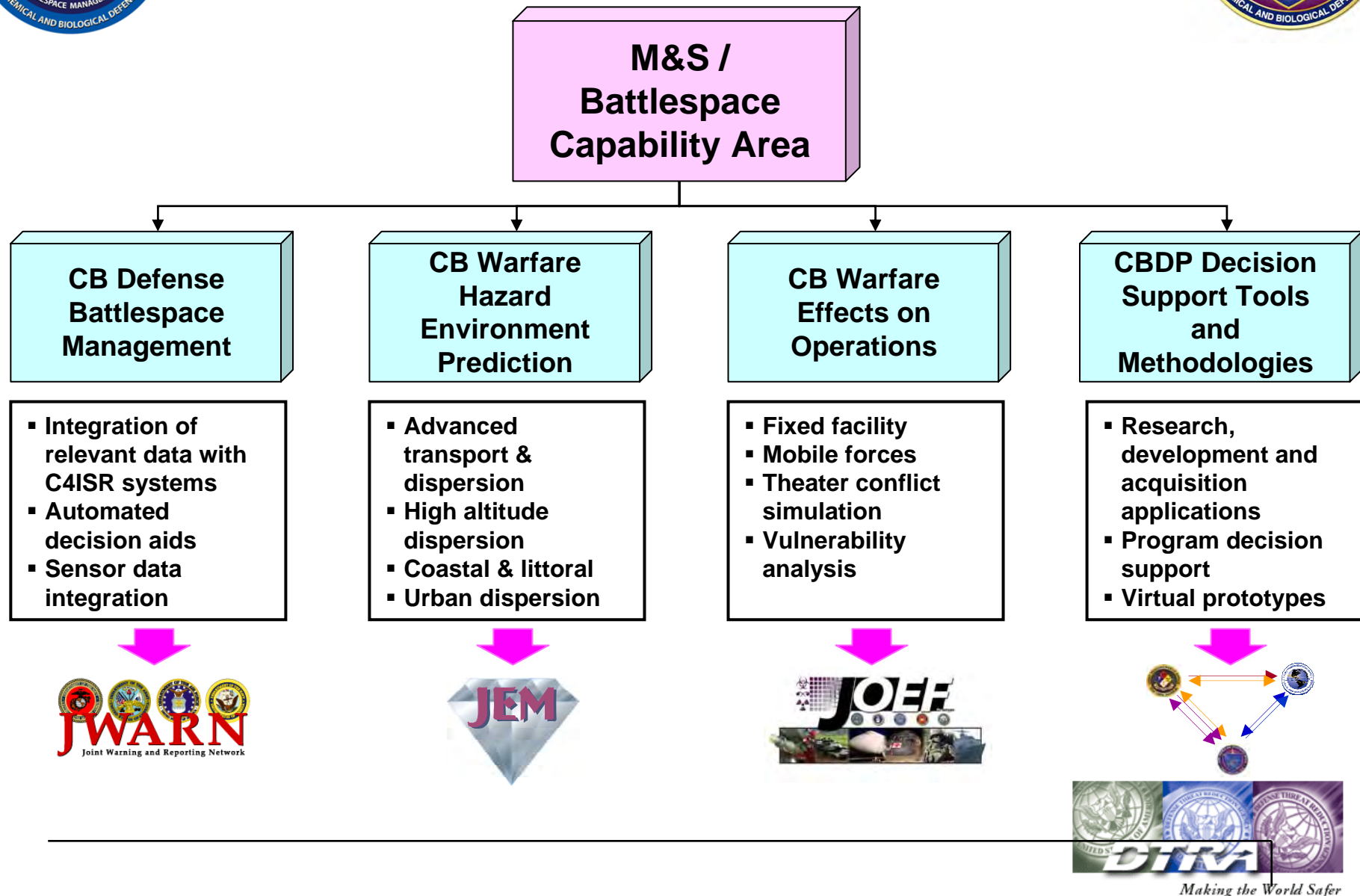
Combatant
Commanders



Making the World Safer

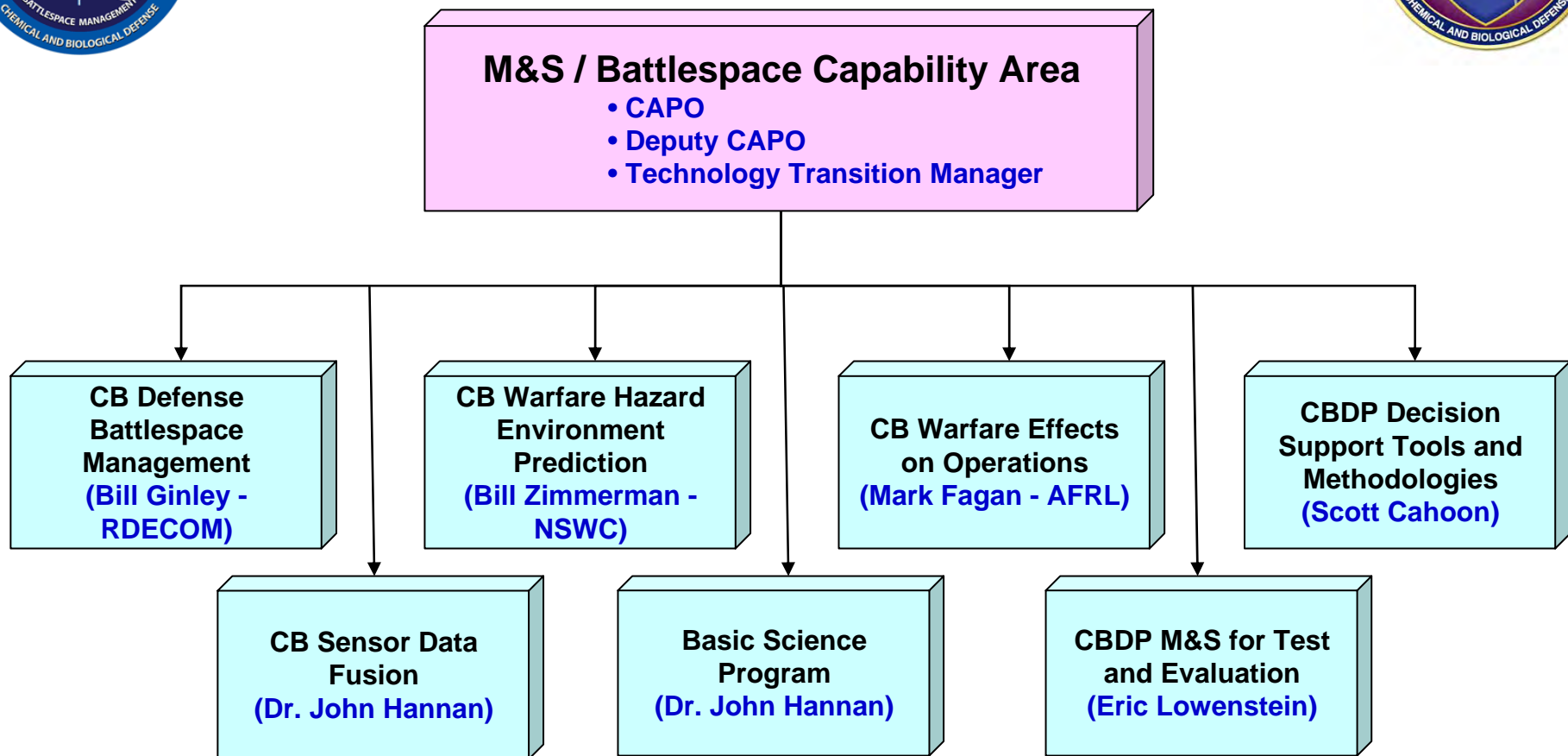


Modeling & Simulation / Battlespace 2005 Taxonomy



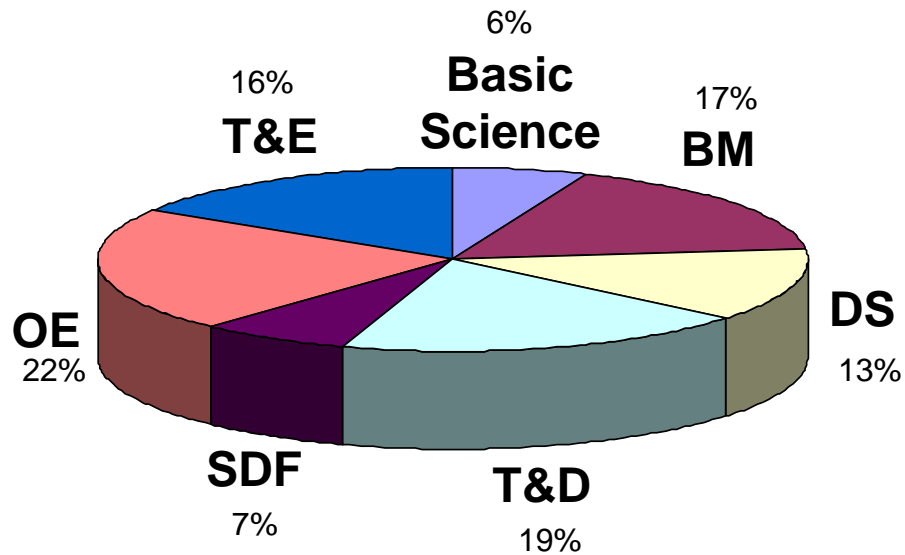


Modeling & Simulation / Battlespace 2006 Taxonomy

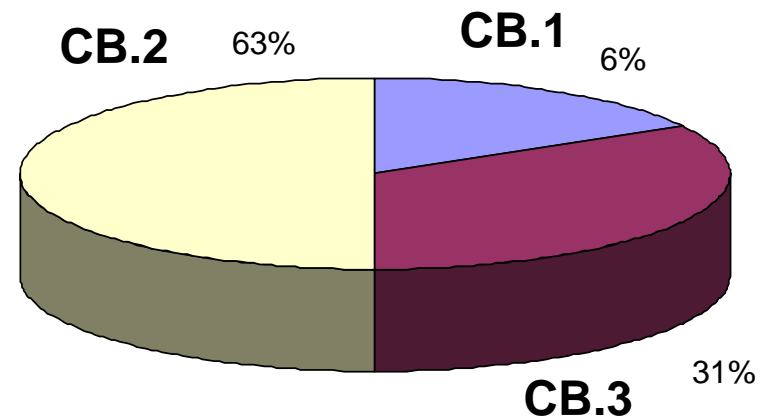




Modeling & Simulation / Battlespace FY06 New Start Funding Summary



Funding By Thrust Area

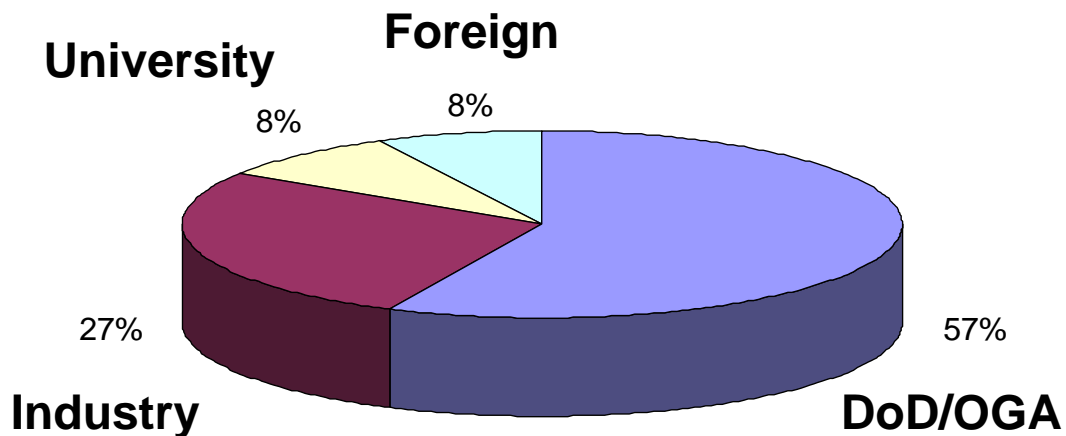


Funding Line Break-out





Modeling & Simulation / Battlespace FY06 Funding Summary



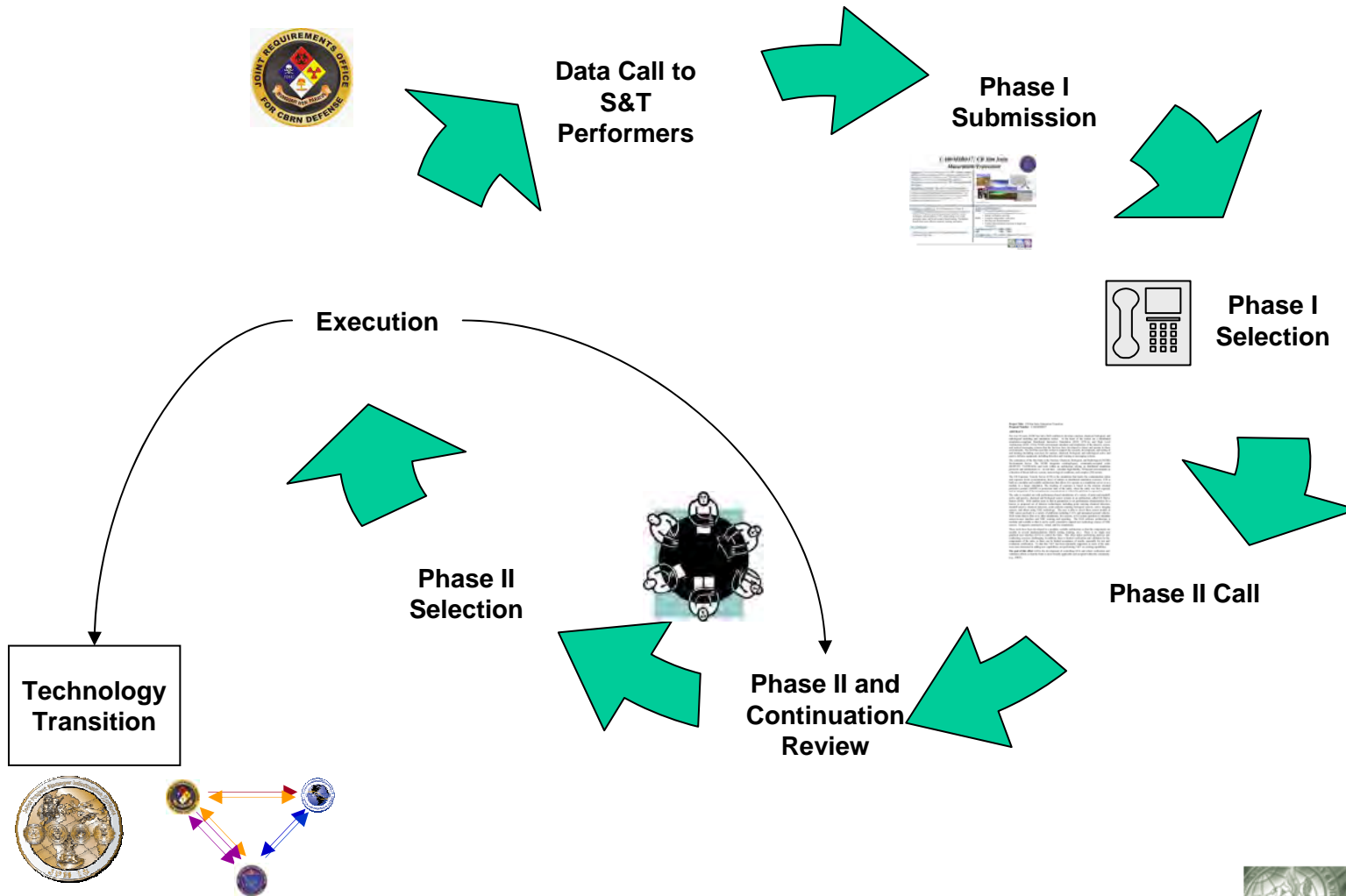
Funding By Performer



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S&T Program Methodology



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Changes for 2006



- **Basic Research Program**
 - Four 6.1 projects slated for start – previous year saw zero.
- **T&E Modeling and Simulation**
 - Overarching models for support T&E
- **DTRA Reorganization and BRAC**
 - Programs people from DTRA come to JSTO
- **Bio-Medical Initiative**
- **More Staff**





Modeling & Simulation / Battlespace Focus on Technology Transition Agreements (TTAs)

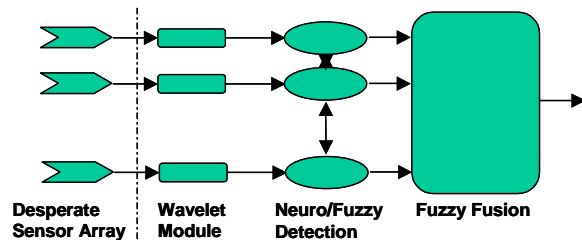


- TTAIS001: Modeling Capability for STAFFS (addendum to existing STAFFS TTA)**
- TTAIS002: CB Simulation Suite Maturation/Transition**
- TTAIS003: CB Sensor Siting Around Building Complexes**
- TTAIS004: Improvements in CBR Operational Effects Modeling Tools and Methods**
- TTAIS005: Improving RUSTIC for Coastal Ocean and Rolling Terrain**
- TTAIS006: Model of Chemical IED Effects on Mobile Forces**
- TTAIS007: Capability for Satisfying Data Requirements of CBRN Tools**
- TTAIS008: Sensor Alert Verification for Incident Operational Response**
- TTAIS009: Common CBRN Software Services**
- TTAIS010: Next Generation CB Battle Management**
- TTAIS011: Measurement of Coastal and Littoral Toxic Material Tracer Dispersion**
- TTAIS012: Methodology Development for Improving CBRN Situational Awareness**
- TTAIS013: Environmental Fate of Agents Chemical**
- TTAIS014: Hazard Prediction with Nowcasting**
- TTAIS015: Release and Atmospheric Dispersion of Liquid Agents**
- TTAIS016: Shared Common Operating Picture for Homeland Security and Homeland Defense**
- TTAIS017: JCID Compliant Thin Server for Sensors**
- TTAIS018: InterLAN Socket Connection Manager (ILSCM)**
- TTAIS019: CB Source Determination**
- TTAIS020: Next Generation Model of CB Effects on Military Operations**
- TTAIS021: CB System Military Worth Assessment Toolkit**
- TTAIS022: JCID on a Chip**



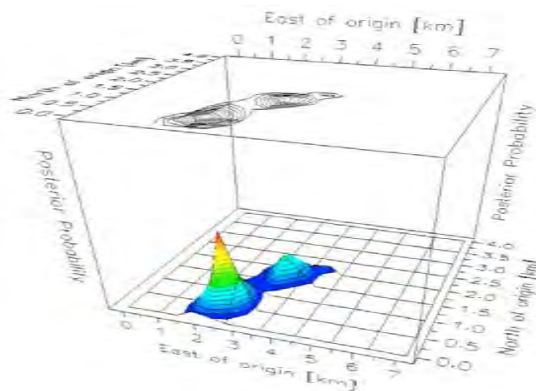


Technology Push: Sensor Data Fusion

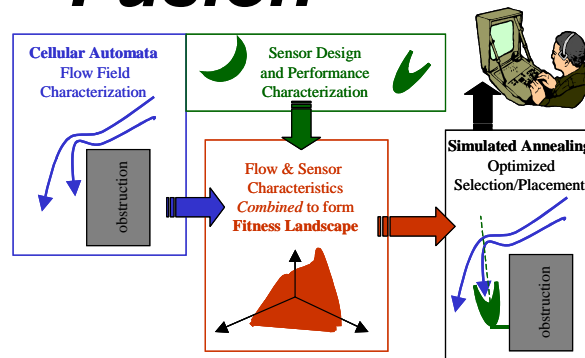


Adaptive, Active, Feedback Sensor Control

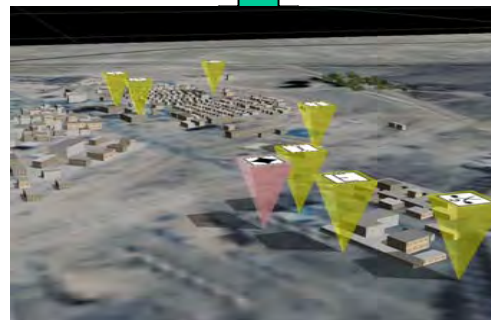
BA04MSB007 - Sensor Network Methodologies



BA05MSB002 - CB Source Determination



BA06MSB018 - Sensor Placement Software Suite



BA05MSB009 - CB Weapon Environment Prediction: Fusion of Sensor and Model Data

Joint Warning and Reporting Network (JWARN);
Joint Effects Model (JEM);
Joint Operational Effects Federation (JOEF)

Fuse sensor arrays with hazard prediction models to optimize sensor placement, reject false alarms, estimate agent sources and achieve advance warning



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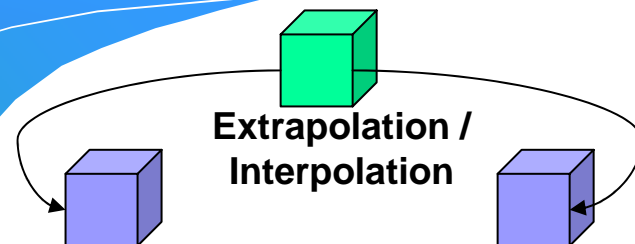


Technology Push: CB Validated Interactive Science & Technology Data Backbone

- Data Backbone Tables**
- Bio agents
 - Chem agents
 - TICs/TIMs
 - Simulants
 - Substrates
 - Background materials

Uses :

Operational applications
Experimentation and Training
Test and Evaluation
Model Development
Method for Permanently Capturing Data
Identification of Areas for Future Research

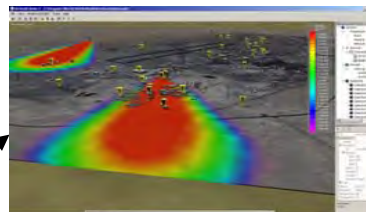


Candidate Data Fields/Attributes

- Genomics
- Proteomics
- Persistence
- Exposure risks
- Signatures
- Environmental variables
- Dose rate
- Vapor pressure
- Spectral signature
- Real data vs. Extrapolated/Interpolated

Agent Fate Data Example

Joint Effects Model: Secondary Effects Module



High Fidelity Model Development



Enhanced Decision Making





Questions?



Making the World Safer

***SCIENCE & TECHNOLOGY
FOR
CHEMICAL BIOLOGICAL
INFORMATION SYSTEMS***

ALBUQUERQUE, NM
24-27 OCTOBER 2005

S&T for Chem Bio Information Systems

General Session

Tuesday, 25 Oct

8:30-8:45	Welcome, Introduction & <u>Admin</u>
8:45-9:15	<u>Keynote – BG Stephen V. Reeves</u>
9:15-9:45	<u>Keynote – COL Ben Hagar</u>
9:45-10:15	<u>JRO for CBRN – LTC M. Bohannon</u>
10:15-10:45	BREAK
10:45-11:10	<u>Technology Transitioning</u>
11:10-11:35	<u>JPM Information Systems</u>
11:35-1:00	LUNCH
1:00-1:30	<u>Joint Effects Model Program</u>
1:30-2:00	<u>Joint Operational Effects Federation Program</u>
2:00-2:30	<u>Joint Warning and Reporting Network Program</u>
2:30-3:00	<u>Joint Project Manager Information Systems Integration</u>
3:00-3:30	<i>Break & Joint Project Manager Information Systems Demo</i>

S&T for Chem Bio Information Systems

General Session

Tuesday, 25 Oct (Cont.)

3:30-4:00	<u>Joint Science and Technology Office Program</u>
4:00-4:30	<u>Environmental Hazard Prediction Thrust Area</u>
4:30-5:00	<u>Operations Effects Thrust Area</u>
5:00-5:30	<u>Battlespace Management Thrust Area</u>
5:30	Adjourn for the day
5:30-6:30	Reception & <i>Joint Project Manager Information Systems Demo</i>



William J. Ginley
Battlespace Management Thrust Area Manager
Edgewood Chemical Biological Center
25 October 2005

CB Defense Battle Management

**Data Fusion,
Indication and
Warning (FIW)**

**CB Defense
Battlespace
Management**

**Automated
Decision Support
(ADS)**

- ◆ Data Fusion
- ◆ Warning
- ◆ Alerting
- ◆ Situational Awareness
- ◆ Information Presentation
- ◆ CB Data Standardization

- ◆ Decision Support Software
- ◆ Data Mining
- ◆ Information Filtering
- ◆ Communications

◆ Making it easier for the warfighter to use what we develop!!!!



Thrust Area Foci

Data Fusion, Indication and Warning (FIW)

CB Defense Battlespace Management

Automated Decision Support (ADS)

BAA05MSB0009: CB Weapon
Environment Prediction:
Fusion of Sensor and Model
Data (6.2)

**Rapid Response Database
Center (6.2)**

**Rapid Response Sensor
Networking (6.2)**

B04MSB1010: Next
Generation CB Battle
Management (6.2)

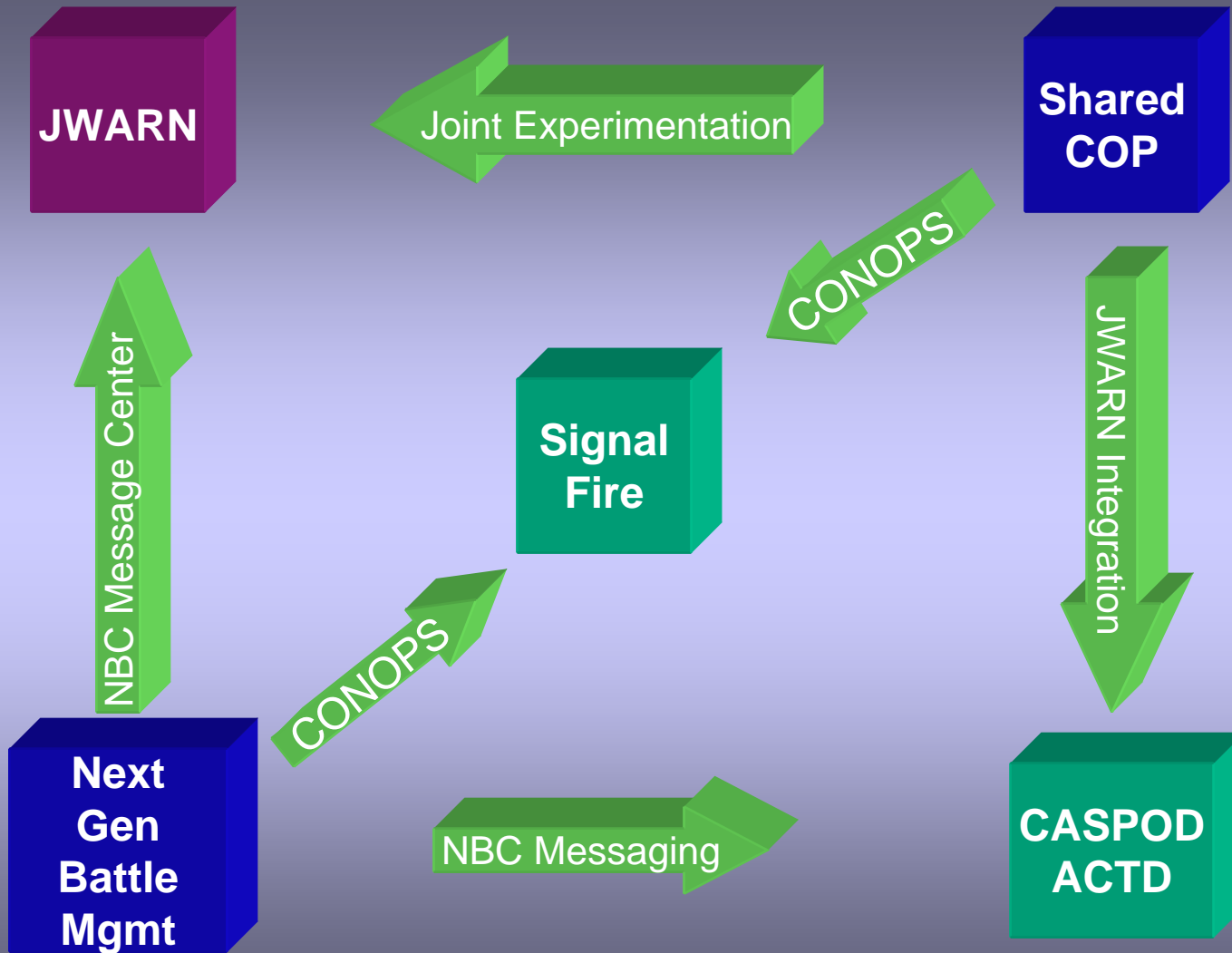
C05MSB0005: Shared
Common Operation Picture
(COP) for HLS & HLD (6.3)

C05MSB0060: Web
Services, NCES, GIG
Integration (6.3)

Looking back on the year that was....



Leveraging and Collaboration





Principal Investigator

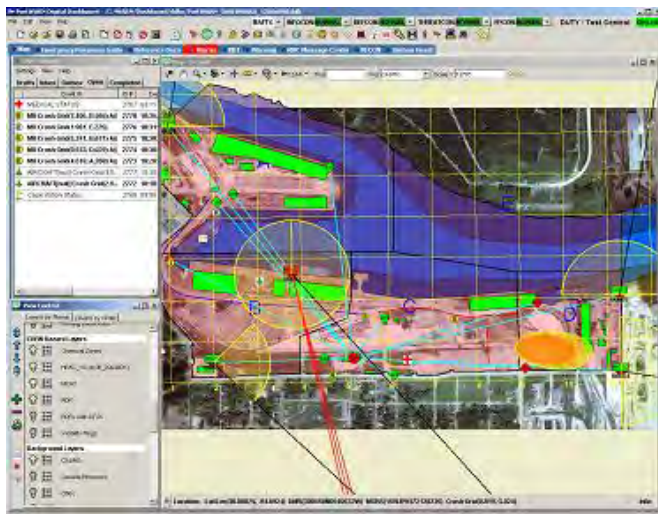
CB Defense
Battlespace
Management

Automated
Decision Support
(ADS)

B04MSB1010: Next
Generation CB Battle
Management (6.2)

Key Elements:

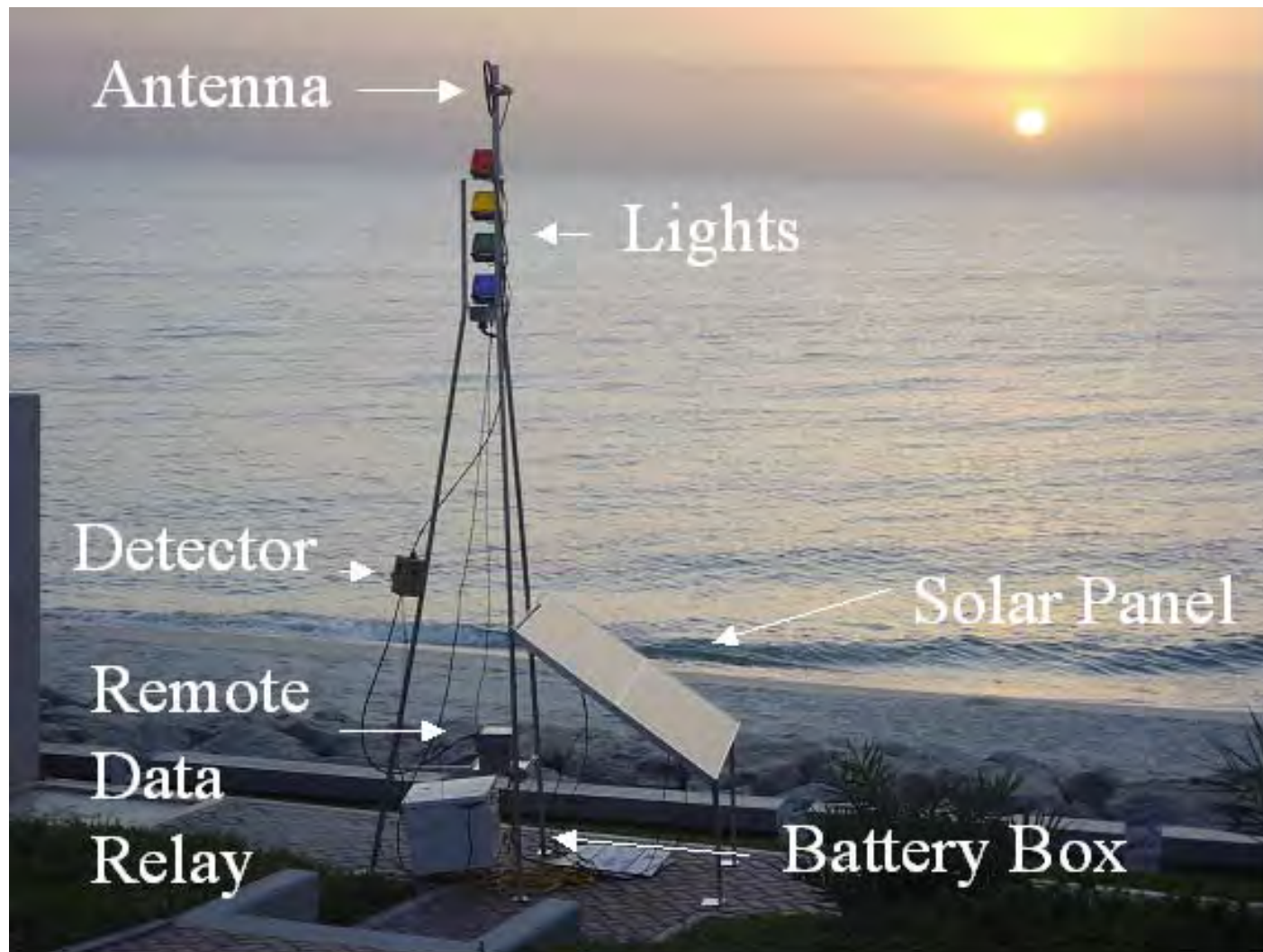
- ◆ Decision Support
- ◆ Multi-Level Networks
- ◆ Active Guidance
- ◆ Intelligent Agents
- ◆ Information Filtering



Description of Effort: Develop a configurable battle management system designed to incorporate modules for data acquisition, contamination region models, mission impact models, information sharing, information display and warning.

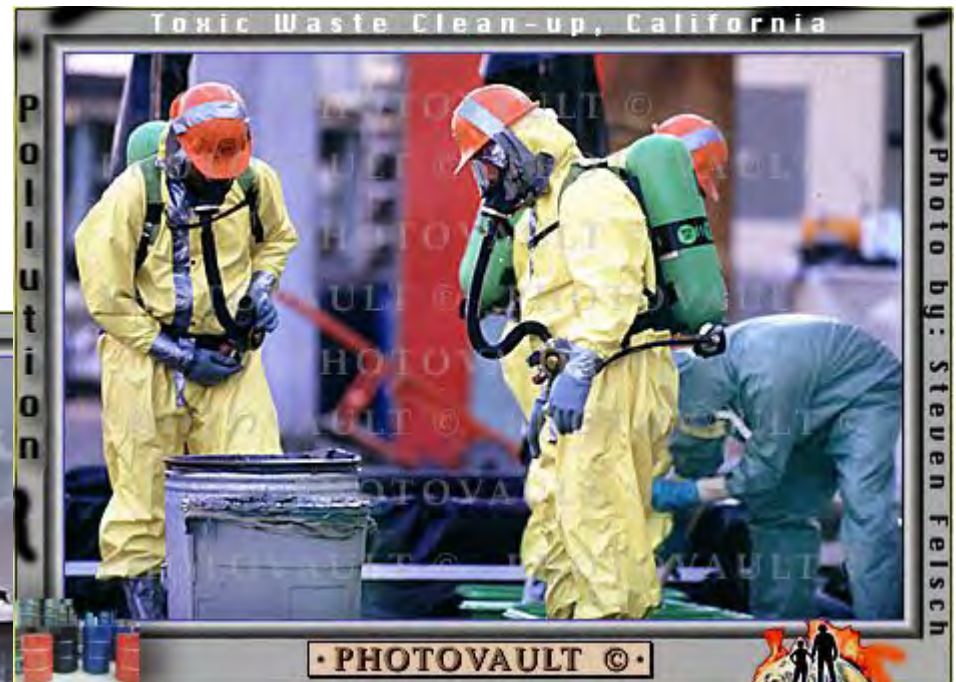
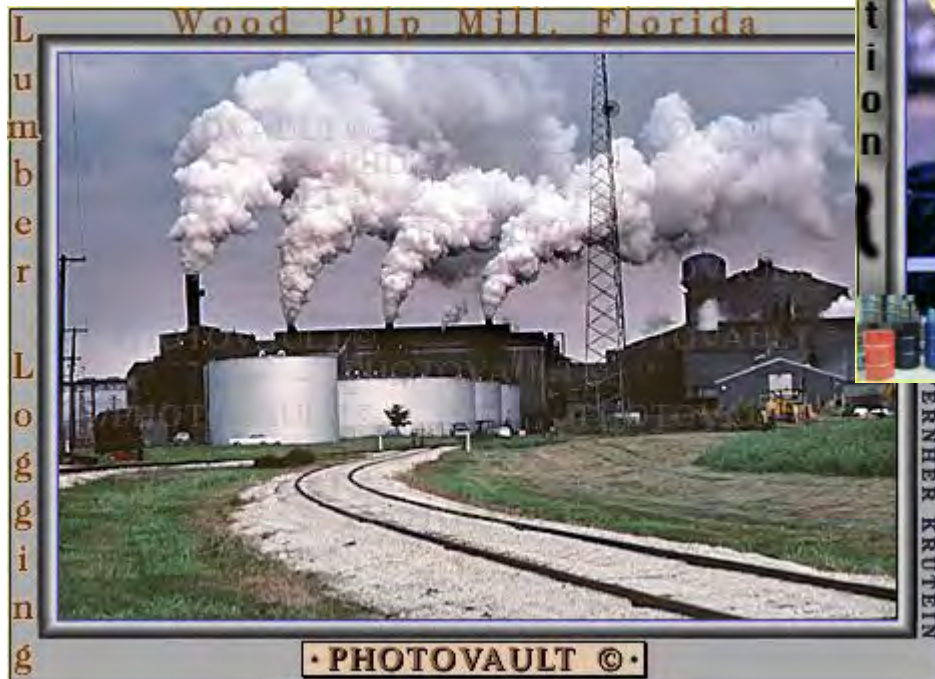
Next Generation CB Battle Mgmt

CASPOD ACTD Node





**Battlespace Management is not
just for CWA, but**



**TOXIC INDUSTRIAL
CHEMICALS TOO!**



Principal Investigator



SPAWAR
Systems Center
San Diego



Supporting

CB Defense
Battlespace
Management

Automated
Decision Support
(ADS)

C05MSB0005: Shared
Common Operation Picture
(COP) for HLS & HLD (6.3)

Key Elements:

- ◆ Data Filtering
- ◆ Multi-Level Networks
- ◆ CB Data Sharing and Standardization
- ◆ CB Alerts Sharing

JWARN

ASSOC/PortWARN



Share Alerts



Sensor
Alert



Sensor
Alert



HLD Sensor Networks



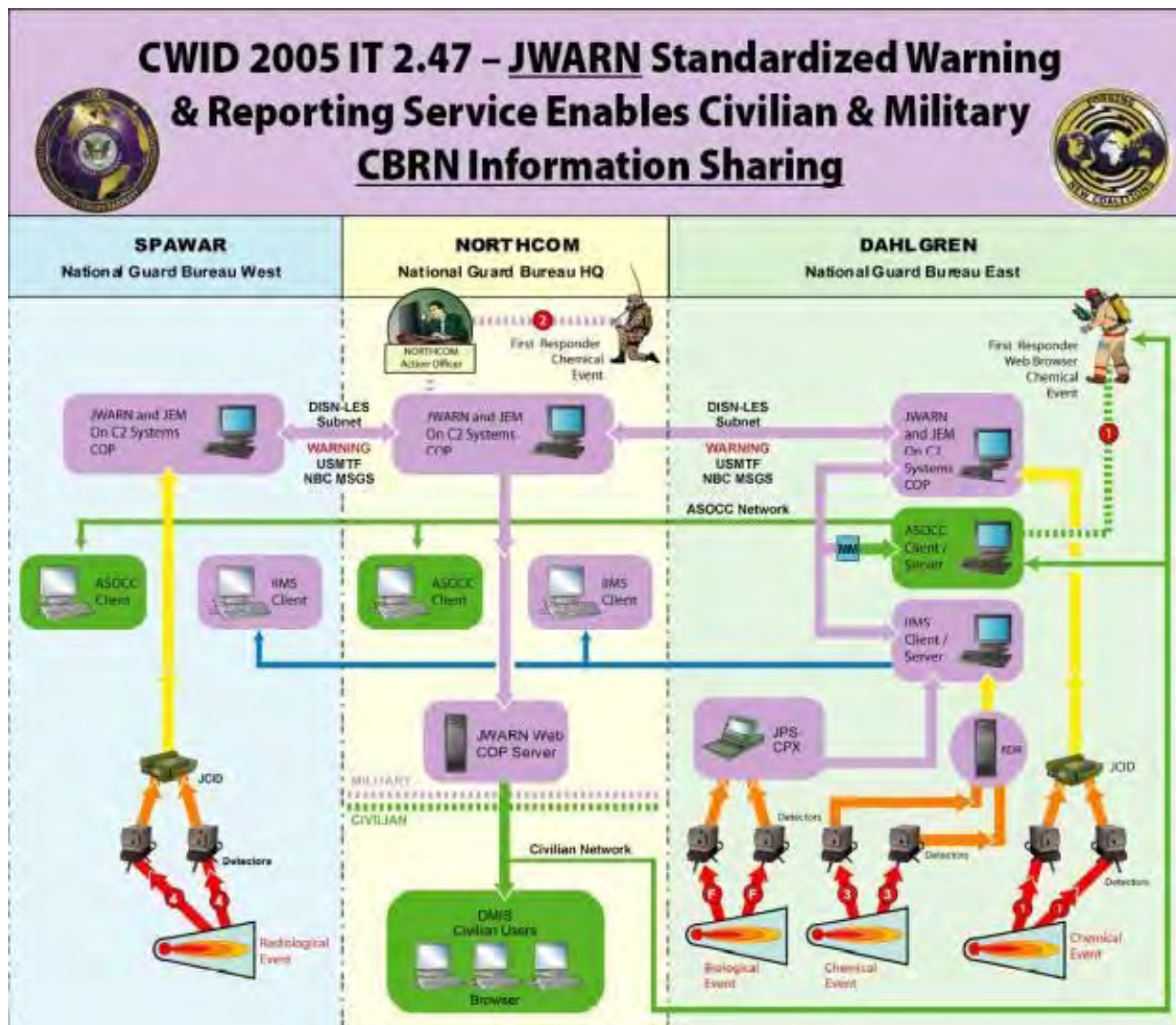
HLS Sensor Networks



Description of Effort: Provide demonstrated interoperability between HLS Early Warning and Reporting targeted Systems Port Warning and Reporting Network (PortWARN) & Area Security Operations Command and Control System (ASOCC) with HLD program of record JWARN.

Shared Common Operating Picture

CWID '05



FY06 Battlespace Management Data Call Topics

1. Develop the concept of **information fusion**. Information fusion includes CBRN detectors, hazard prediction, and incident management. Information fusion should feed decision support applications that are premised on active guidance. **Develop a tool that identifies patterns, trends and relationships that assist the warfare commander in development of a course of action in response to an impending threat.**
2. The Joint Warning And Reporting Network (JWARN) program is building the **JWARN Component Interface Device (JCID)**. With the JCID, the number of detectors that are capable of being networked will rise significantly in the coming years. Detectors will continue to be unit assets. The operational reality is that detectors will join then leave networks as units move through areas. **Develop a program to determine the impact to contamination avoidance, hazard prediction, local situational awareness, and local CB coverage**. Ensure that it can function in an operational environment.

FY06 Battlespace Management Data Call Topics

3. The **CBRN data model** is an evolving standard being produced by the Joint Program Executive Office – Chemical/Biological Defense (JPEO-CBD). **Propose exploitation efforts of the CBRN data model** for the purposes of verification and validation of the schema against emerging CB programs
4. Multiple runs of a hazard prediction model typically accomplish the current process of **locating detectors on the battlefield**. This process works fine in an analytical environment but is not operationally suited for field use. **Propose a sensor placement model.**

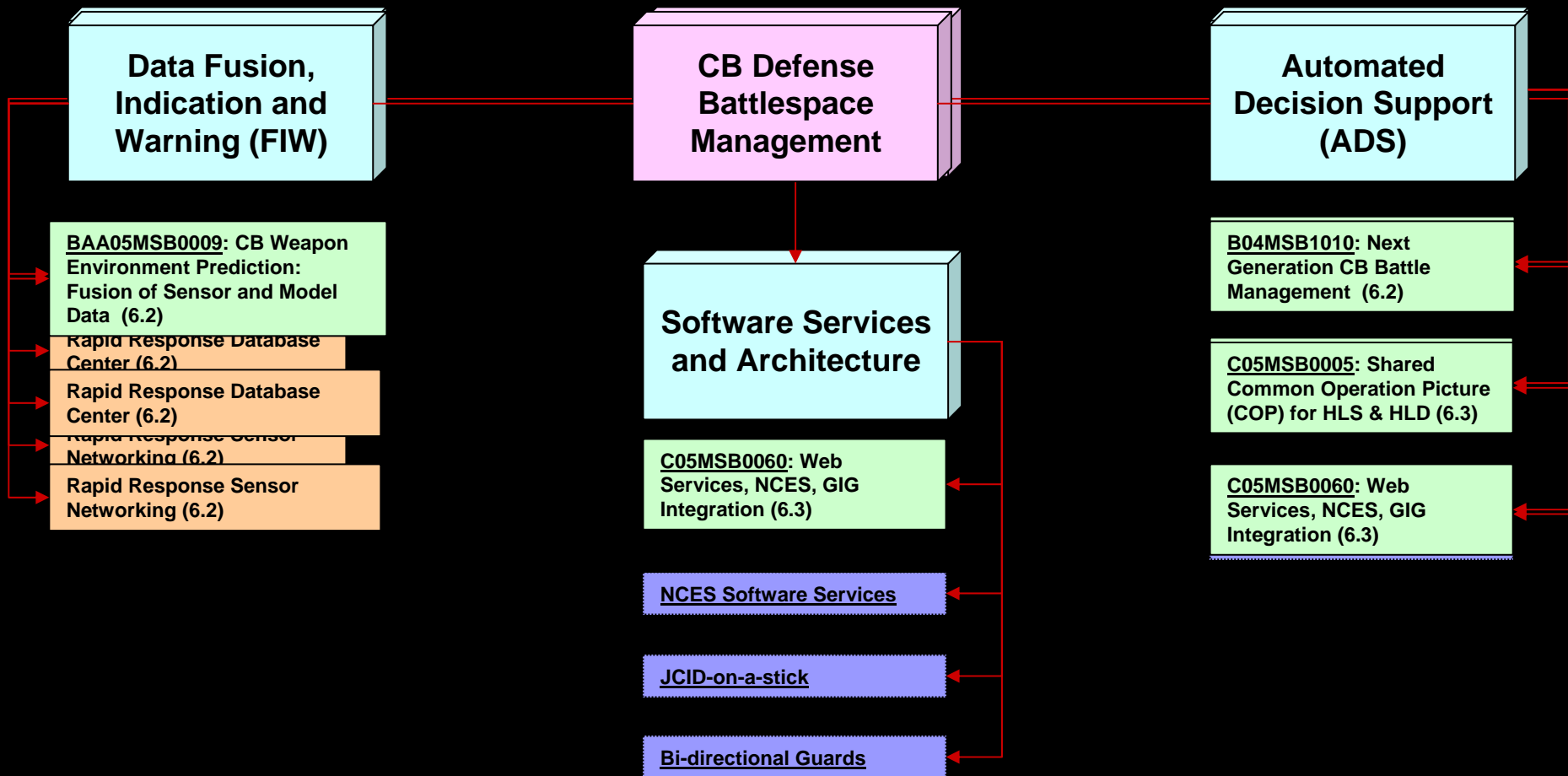
FY06 Battlespace Management Data Call Topics

5. Detector data is tactically reported over networks using commercial wireless technology or tactical radios. The ability to **move** that **data** from the **single channel domain** in which it was transmitted to **classified networks** has not been seriously addressed. **Propose an affordable method for moving sensor data to a classified network that can be certified in an operational environment.**
6. Detector locations in fixed sites typically employ a **node concept**. A node is an integration point where multiple detectors can be plugged in for the purposes economizing on force protection and power. Employing multiple detectors at a node means that the limited assets are pooled and thus leaves other areas uncovered or exposed. **Propose a concept for deploying detectors that avoids the node concept, addresses force protection concerns, and extends the coverage of the fixed site.**

FY06 Battlespace Management Data Call Topics

7. JWARN Component Interface Device **(JCID)-on-a-chip**. Field Programmable Gate-Array that has most of the features/functionality **JCID software embedded** into it and has an area that allows COI message sets (personalities/protocols) to be dynamically programmed/loaded. These could ultimately end up in Automated Chemical Agent Detector Alarms (ACADAs), etc. so that the **sensors** ultimately come **off the shelf net ready** and speaking the right data protocol/language.

Looking forward to '06....



FY05 Battlespace Management Program Build

Guidelines for '06 Projects

- Develop cells within digital dashboard
- Java
- Minimal GUI development, use digital dashboard to maximum extent possible
- Technology Transition Agreements
- Data Model
- “We ♥ JEM”TM
- Demonstrable progress – Align with DoD exercises where practical

Questions, Comments, Observations,
Complaints, Idiosyncrasies



William J. Ginley
Battlespace Management Thrust Area Manager
Edgewood Chemical Biological Center
25 October 2005

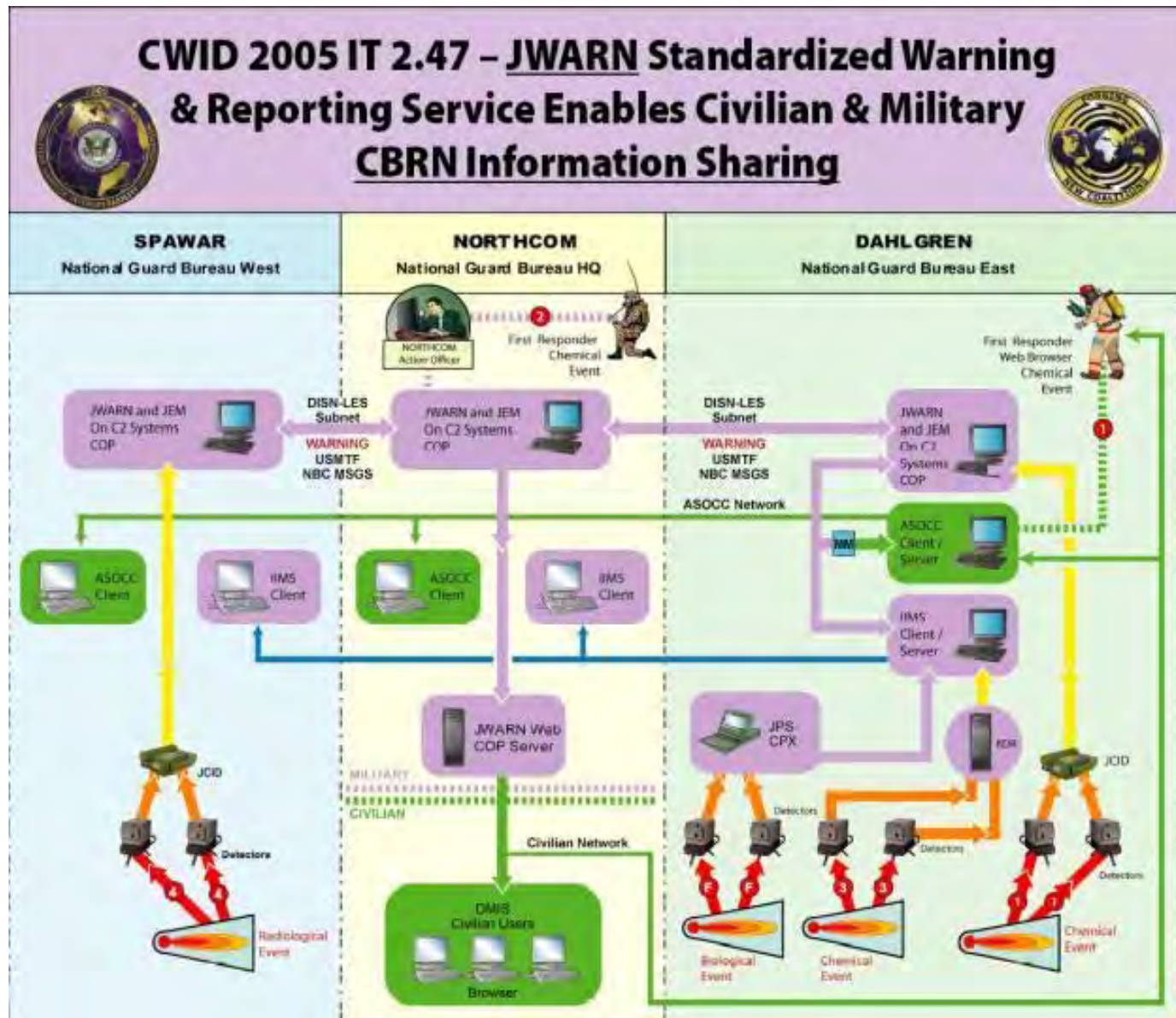
Shared Common Operating Picture



First Year Focus

- Interoperability
- Determining and then providing actionable information between system for local display
- Addressing local domain issues and assessing impacts of working on a common backbone with local security policies

JWARN's Standardized Warning and Reporting Service Enables Civilian and Military CBRN Information Sharing





Supporting Details

- Active collaboration between SPAWAR, DTRA and ECBC to develop a capability that could serve as the model for interoperability demonstrations.
- Builds on S&T development of Next Generation Battle Management and the Contamination Avoidance at Seaports of Debarkation ACTD
- Provides a blue print to transition efforts from S&T to 6.4

Key Findings

- CAP Messages are emerging, but require further work... Required a message mediator be built to process between them. Simple middleware program to convert
- Common Message Parser very difficult to work with
- Integration points or bridges versus complete integration



Second Year Focus

- Connecting to different security levels and passing data generated by sensor networks operating on local policies and information assurance procedures
- Explore the differences of local domain issues (DHS vs DoD) and discover and solve impediments to passing data



Chemical and Biological Technology for the Joint Warfighter

COL Benjamin Hagar

Joint Science & Technology Office

CBDP

&

Chemical and Biological Technologies Directorate

Defense Threat Reduction Agency

25 October 05



Making the World Safer



Outline

- Vision and principles
- Program requirements
- Budget
- Technical program
- Technology transition





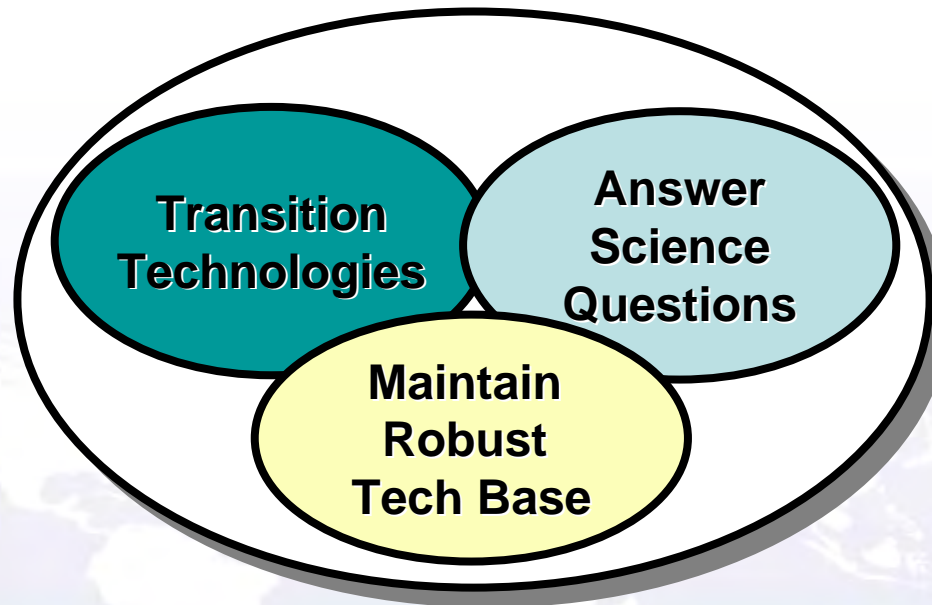
JSTO manages and executes the S&T component of the program





Vision

Develop and sustain a robust, agile, and flexible science and technology program to support chemical and biological defense capability needs





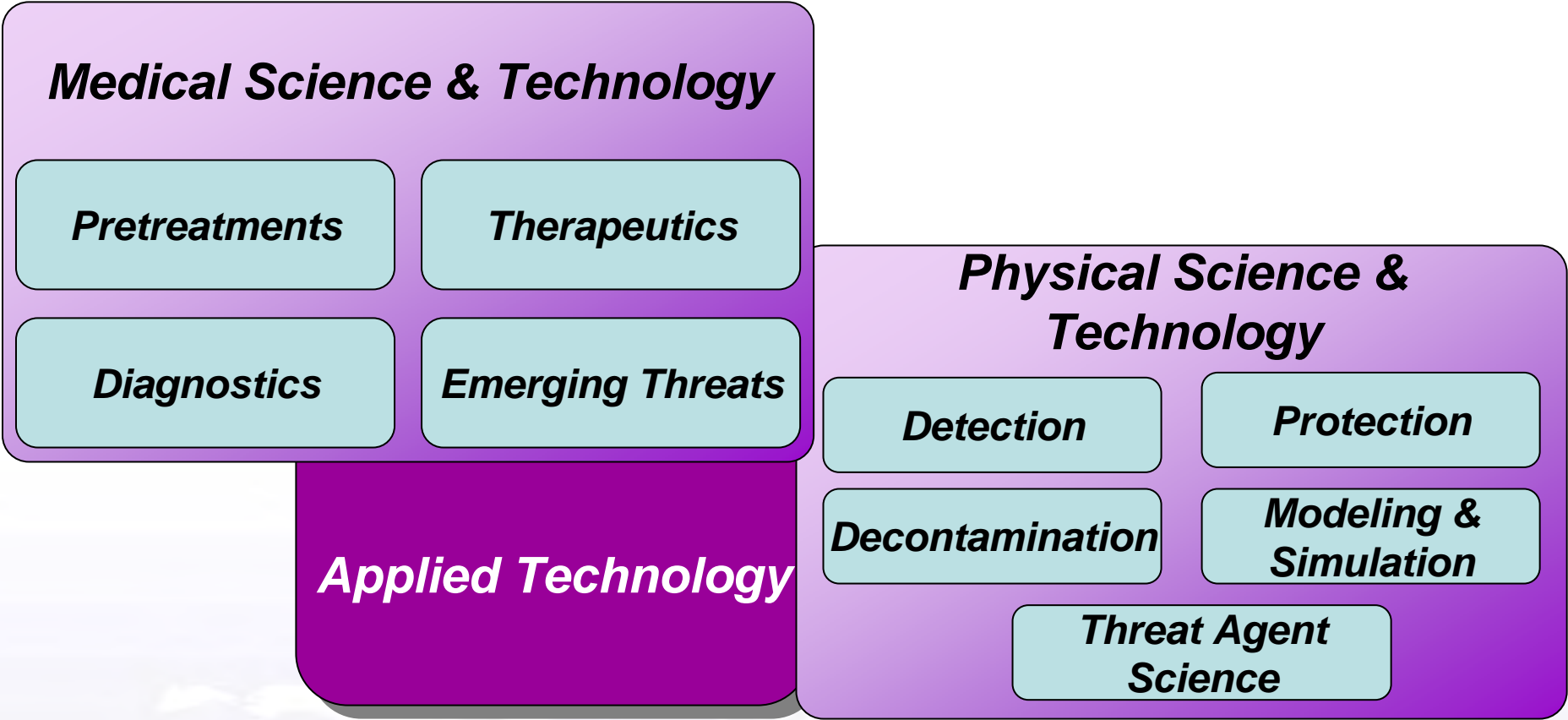
CBDP S&T is...

- **Technically challenging**
 - Exceedingly high customer expectations
 - No "silver bullet" solutions
- **Scientifically diverse**
 - Numerous and disparate disciplines
 - Distinct chemical and biological solutions





JSTO manages by capability areas



CAPOs empowered to make program decisions



We reach out to the best-in-class performers



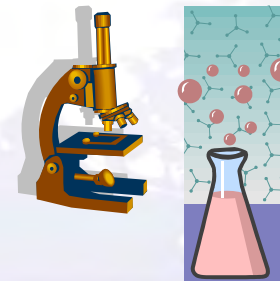
Academia



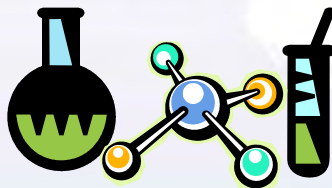
Industry



FFRDCs



Service Labs/Agencies

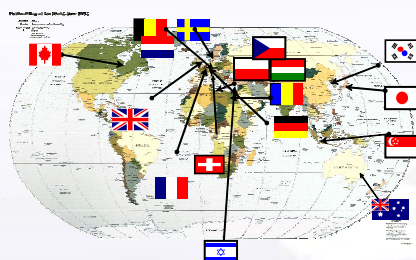
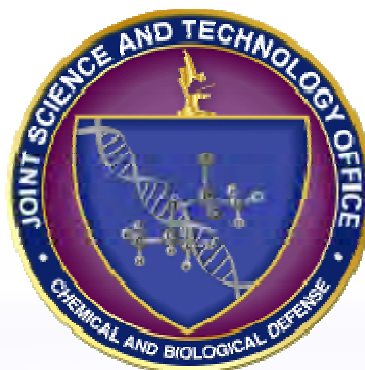


National Labs





We leverage the efforts of others



International Partners



Making the World Safer



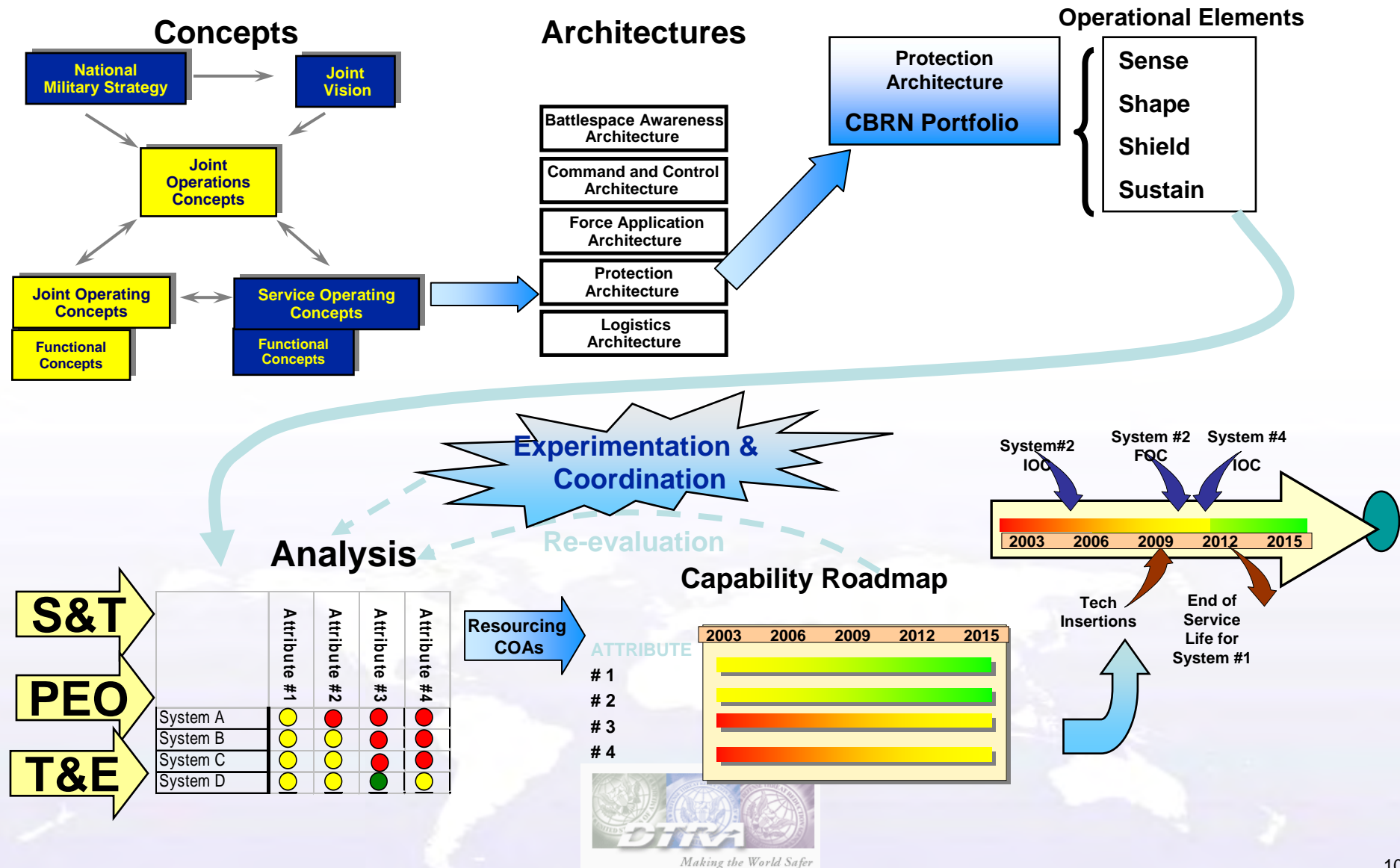
Joint Functional Concepts

- **Battlespace Awareness**
- **Command and Control**
- Force Application
- Protection
- Logistics





The JRO conducted a baseline capability assessment





7 of the Top 10 BCA gaps are **SHAPE**

NUMBER	OP&L ATTRIBUTE	CORE CAPABILITY	GAP or SHORTFALL
1	SENSE	STAND-OFF DETECTION - BIO	NO CAPABILITY, ONLY DEVELOPMENTAL
2	SHAPE	INTEGRATED EARLY WARNING	LACK OF A BACKBONE
3	SHAPE	INTEGRATED EARLY WARNING	LIMITED SENSOR INTERFACE AND INTEROPERABILITY
4	SHAPE	INTEGRATED EARLY WARNING	LACK OF SELECTIVE ALARMING
5	SHAPE	BATTLE SPACE ANALYSIS	LIMITED ALGORITHM TO SUPPORT ANALYSIS (V,V,&A)
6	SHAPE	BATTLE SPACE ANALYSIS	LACK OF ANALYSIS TOOLS
7	SENSE	STAND-OFF DETECTION - CHEM	LACK OF RANGE
8	SHAPE	BATTLESPACE MANAGEMENT	NO AUTOMATED DECISION TOOLS
9	SHAPE	BATTLESPACE MANAGEMENT	LIMITED INTERFACE W/ COP
10	SENSE	STAND-OFF DETECTION - CHEM	LIMITED ABILITY TO DETECT AND IDENTIFY
11	SHIELD	EXPEDITIONARY COLLECTIVE PROTECTION	INTEGRATION LIMITATIONS (SIZE, POWER, WEIGHT)
12	SUSTAIN	INDIVIDUAL DECON	INADEQUATE PROCESSING RATE FOR THOROUGH DECON
13	SUSTAIN	INDIVIDUAL DECON	LACK OF EFFECTIVENESS FOR CHEM (NTAs) and BIO (ANTHRAX)
14	SHIELD	MEDICAL PROPHYLAXES	LACK OF MULTI-VALENT VACCINES
15	SHIELD	MEDICAL PROPHYLAXES	LACK OF PROPHYLAXES FOR CHEMICAL WARFARE AGENTS
16	SHIELD	MEDICAL PROPHYLAXES	LACK OF "ON-LABEL" FDA APPROVAL FOR RAD PROPHYLAXES
17	SUSTAIN	EQUIPMENT DECON	DECONTAMINANTS AND APPLICATORS DEGRADE SENSITIVE EQUIPMENT
18	SUSTAIN	EQUIPMENT DECON	DECONTAMINANTS AND APPLICATORS DEGRADE EQUIPMENT
19	SHIELD	RESPIRATORY & OCULAR PROTECTION	LIMITED PROTECTION AGAINST TICs
20	SENSE	POINT DETECTION - BIO	LACK OF DETECTORS THAT ARE SMALL AND ACCURATE (SIZE, WT, ACCURACY)
21	SENSE	POINT DETECTION - BIO	HIGH OPERATING COSTS OF CURRENT DETECTORS
22	SUSTAIN	MEDICAL THERAPEUTICS	LIMITED ANTI-VIRAL/ ANTI-TOXIN DEVELOPMENT
23	SUSTAIN	EQUIPMENT DECON	INADEQUATE PROCESSING RATE FOR THOROUGH DECON
24	SUSTAIN	MEDICAL THERAPEUTICS	LACK OF "ON-LABEL" FDA APPROVAL FOR CBRN THERAPEUTICS
25	SHIELD	EXPEDITIONARY COLLECTIVE PROTECTION	QUANTITY
26	SHIELD	PERCUTANEOUS	LIMITED DUSTY AGENTS PROTECTION
27	SHIELD	PERCUTANEOUS PROTECTION	HEAT BURDEN
28	SENSE	NBC RECON	LIMITED SENSOR INTEGRATION
29	SHIELD	RESPIRATORY & OCULAR PROTECTION	QUANTITY
30	SENSE	POINT DETECTION - CHEM	QUANTITY
31	SENSE	POINT DETECTION - CHEM	LIMITED DETECTION OF SOLIDS AND LIQUIDS
32	SHIELD	PERCUTANEOUS PROTECTION	QUANTITY OF JSLIST
33	SENSE	POINT DETECTION - CHEM	LIMITED DETECTION OF NTAs/ TICs
34	SUSTAIN	FIXED SITE DECON	DECONTAMINANTS AND APPLICATORS DEGRADE EQUIPMENT, FACILITIES, AND MATERIAL
35	SUSTAIN	DIAGNOSTICS	LACK OF PORTABILITY FORWARD
36	SUSTAIN	DIAGNOSTICS	LACK OF FDA APPROVAL
37	SENSE	POINT DETECTION - RAD	QUANTITY
38	SUSTAIN	DIAGNOSTICS	NEED FOR REAGENT REGISTRY VERIFICATION
39	SUSTAIN	FIXED SITE DECON	INABILITY TO DECONTAMINATE INTERIORS OF FACILITIES AND LARGE AREAS





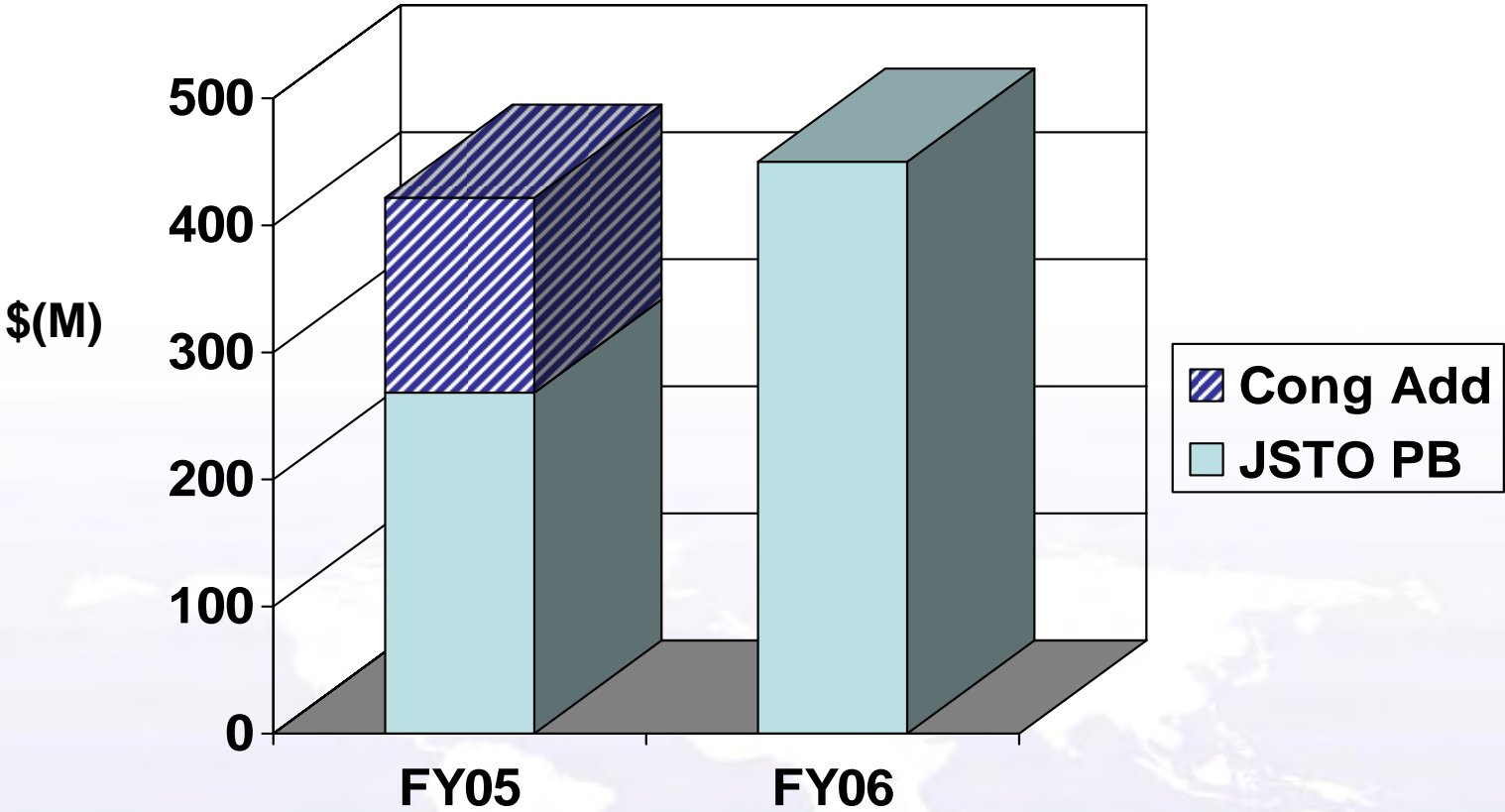
Enhanced Planning Process Guidance (EPP) Guidance

- **Combating the Proliferation of Weapons of Mass Destruction (WMD) is a SECDEF Top-10 Priority**
- **SPG Guidance: Develop Funding Options to Reduce Risk for:**
 - **Chem-Bio Defense Program: Address the Chemical, Biological, Radiological, Nuclear Defense Program (CBRNDP) Capability Gaps Identified in the Baseline Capabilities Assessment (BCA)**
 - **Combating WMD Operations: Identify Executive Agents for New Missions (Interdiction and Elimination)**
 - **WMD Infrastructure: Address Intellectual and Physical Infrastructure Recapitalization for Medical and Non-medical Laboratories and Key WMD Testing and Evaluation (T&E) Facilities**





President's budget request reflects significant increase to S&T





EPP and JSTO Initiative Impacts on M&S/B Capability Area

- **More Than a Three-fold Increase in Resources Committed to S&T for Shape**
- **Significant Focus on Technology Transition to JPEO**
 - Over 22 TTAs currently in work between JPM-IS and M&S/B
- **Extension of M&S/B S&T activities beyond direct support to JPM-IS:**
 - Stand-Up of a T&E Modeling and Simulation Thrust Area to support DT/OT for entire Program
 - Initiatives to apply Systems Engineering approaches to enhance decision making capability across program; e.g., Decision Support Thrust Area



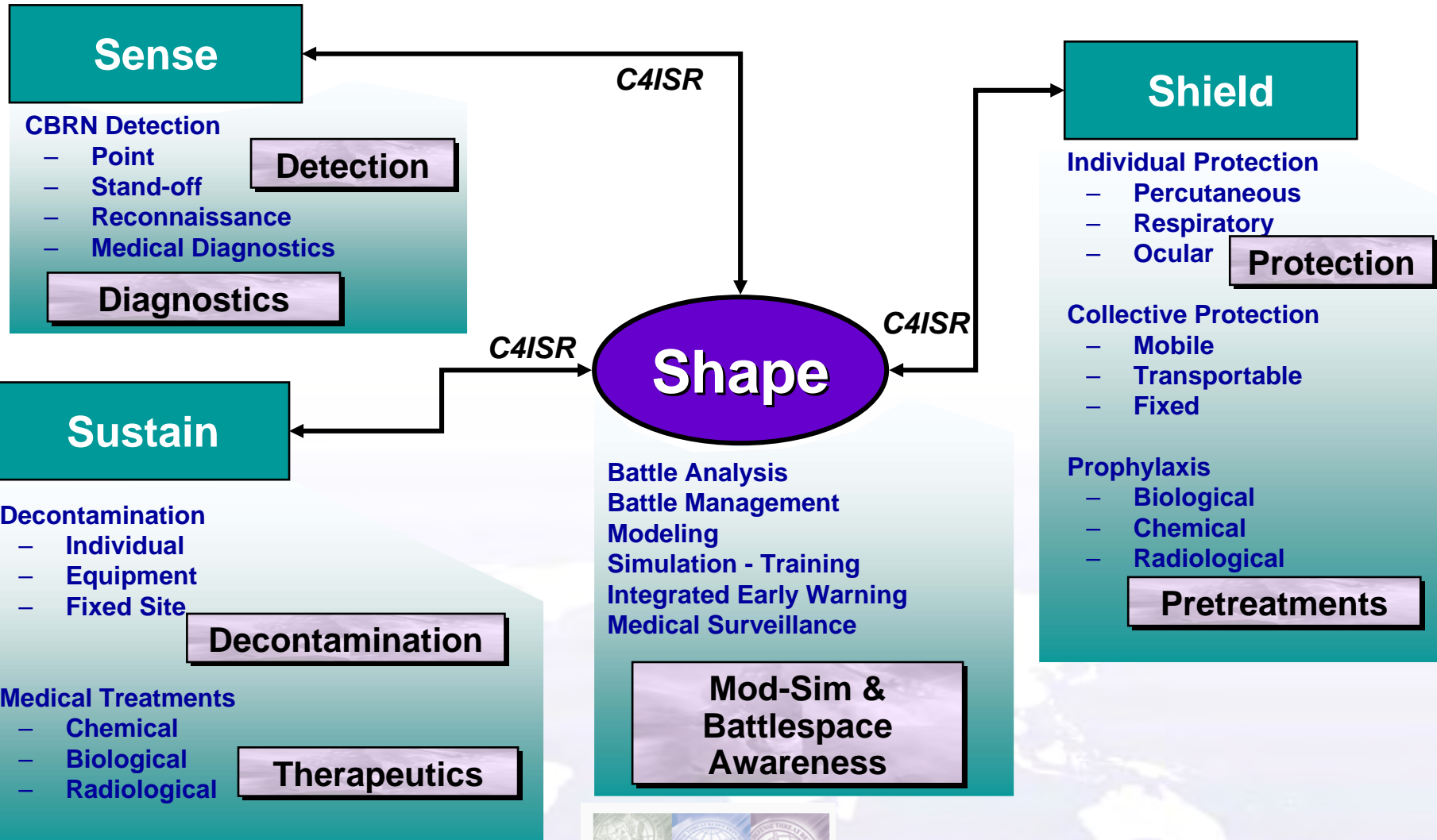
Other Changes for M&S/B Thrust Area

- **Revitalizing the Basic Research effort in 2006 for the M&S/B Capability Area including four new proposed 6.1 projects.**
- **Focus on technology push initiatives:**
 - **Sensor Data Fusion**
 - **S&T Data Backbone**
- **Extend search for revolutionary (vice evolutionary) approaches**
 - **Participation in experimentation**
 - **Interaction with other Capability Areas, including Medical**
 - **Fostering more participants in the M&S/B S&T projects (i.e., academia, non-DoD, industry, ally S&T establishment)**





Shape is Central to CBRN Defense Operational Elements





M&S/B Capability Area Capitalizes on Leveraging Opportunities Wherever Possible

- Past efforts in developing CBD battle management system (RestOps and PortWarn) are being directly leveraged by the S&T program to support JWARN
- Previous work at ECBC is being tapped to help a virtual prototyping capability for Decision Support
- Previous achievements by the former DTRA/TD Directorate are directly aiding birth of new operational systems:
 - HPAC to JEM
 - CATS to JOEF
- Threat Science Capability Area is directly contributing to expansion of JEM capabilities via leveraging the Agent Fate Program into the Secondary Effects Module





We have formalized the transition process

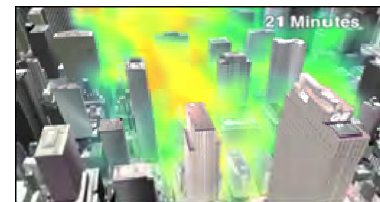
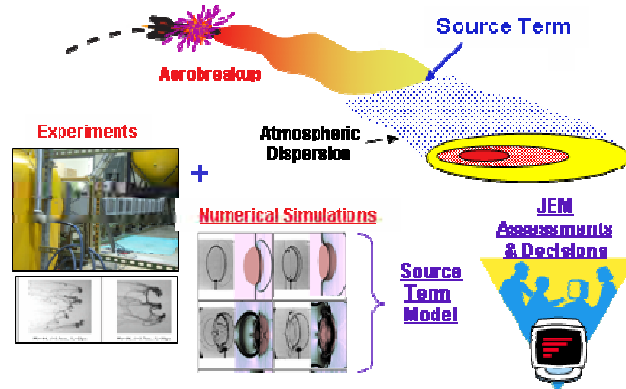
- Technology transition agreements
- Quarterly reviews
- Technology transition evaluation



STAFFS Transition to JOEF is a seminal example for the CDBP.



Example of S&T Alignment with Materiel Developer

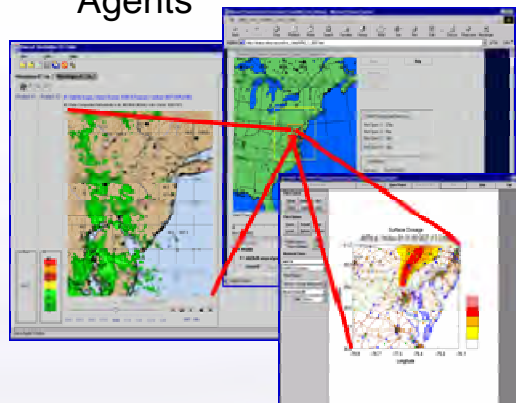


NRL CFD
Simulation of
contaminant
release in NYC

University of
Hamburg
Urban Wind Tunnel
Oklahoma City
Layout



BA05MSB007 - Release and
Atmospheric Dispersal of Liquid
Agents

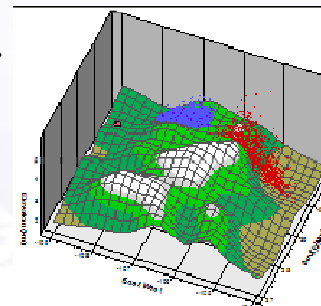


- Continuous, high-resolution meteorological data fusion
- Blended with multi-scale meteorological forecast data
- Automatically updated web CB effects product

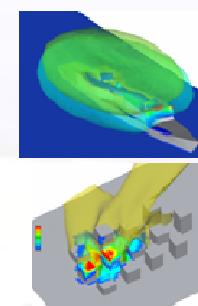
BA04MSB001 - (DTO CB.62):
Hazard Prediction with Nowcasting

BA06MSB003 – Benchmark for
Computational Modeling of Urban Flows

Atmospheric Transport



Ship/Urban Transport



**Joint Effects
Model (JEM)**

BA04MSB003 - (DTO CB.55): Chemical and
Biological Hazard Environmental Prediction

Improved source term models and real time meteorological data are integrated with high resolution turbulence models; model elements are verified and validated



Future Challenges and Initiatives for the Program

- Challenges:
 - Rapid obsolescence of IT systems
 - Lack of well defined metric for determining best investments
 - Rapid incorporation of advanced threat agent information
 - Maintaining a focus on the warfighter/end user
- Initiatives:
 - Near-term examples
 - Sensor Data Fusion Program
 - Significant focus on accelerated transition process, e.g., Agent Fate goes to the JEM Secondary Effects Module
 - Development of the Multivariate Decision Support Tool by UNM
 - Far-Term
 - Future focus will be to develop a scientific data backbone for use by the S&T, developer, and warfighter community
 - Launching initiative to integrate biological and medical modeling efforts





Joint Operational Effects Federation (JOEF)

Program Overview

25 October 2005

**Dr. Jerry Hoffman
JOEF Acquisition Program Manager
jerome.hoffman@navy.mil**



Background

PROGRAM SUMMARY:

Enables warfighters and planners to assess CBRN effects on operations, personnel, and equipment and to recommend COAs to minimize or eliminate threat.

HOST C4I SYSTEMS:

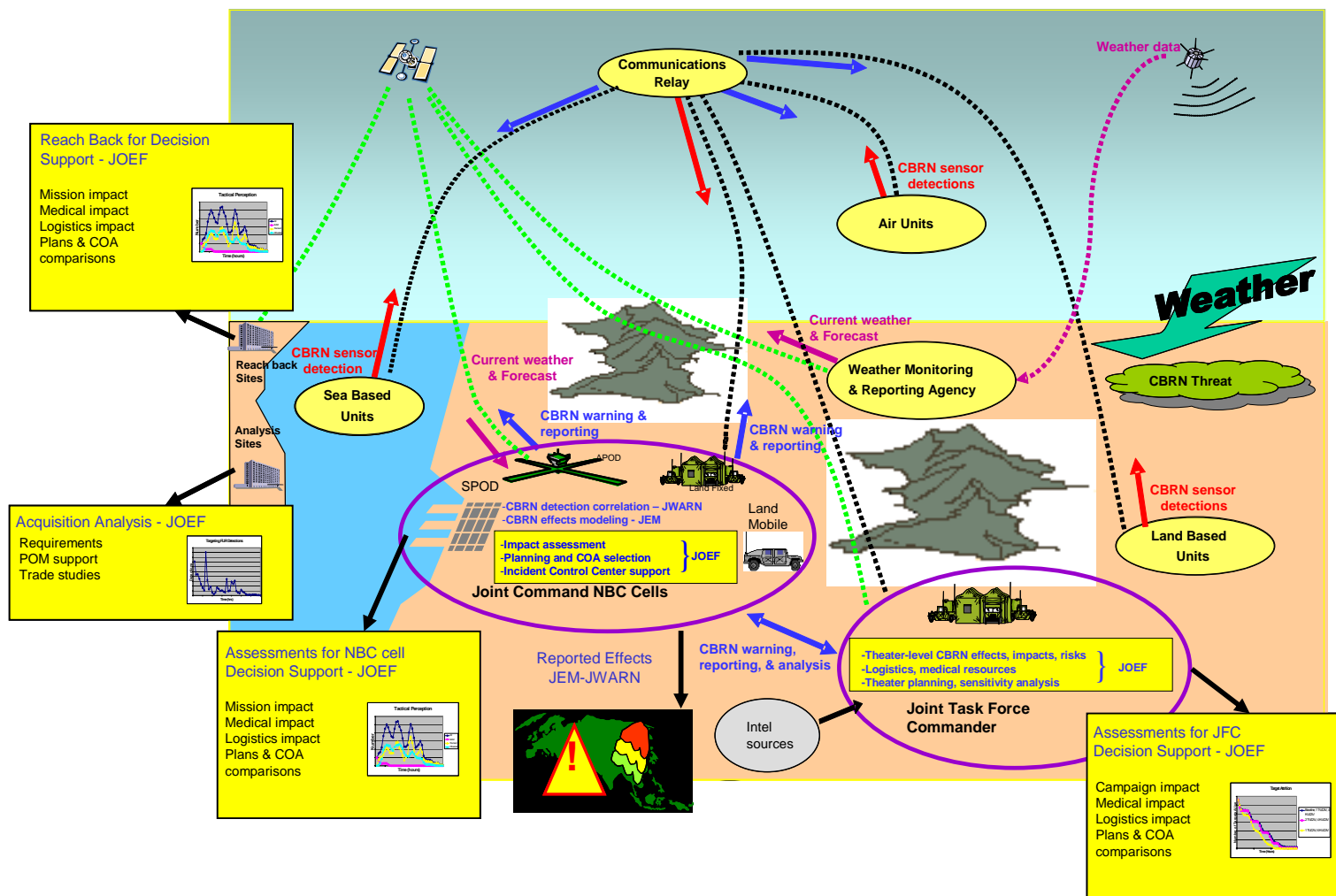
GCCS-J, GCCS-M, GCCS-A, GCCS-AF, GCCS-K, JC2, TBMCS, C2PC

USERS:

Strategic and Operational Planners, Joint Commanders & Staff, NBC Command Center



Operational View (OV-1)



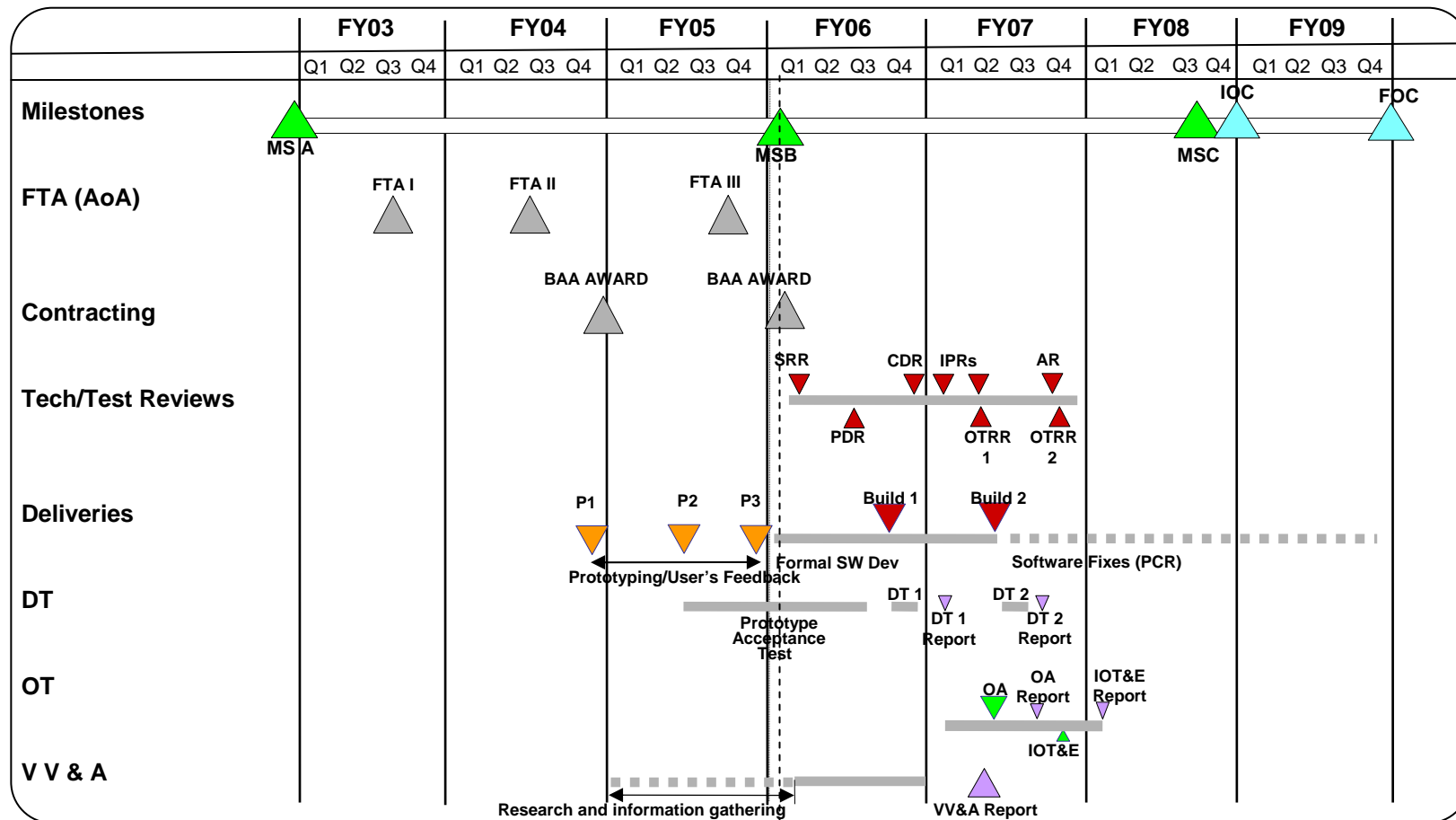


JOEF Core Capabilities

- 1) Provide a Deliberate/Crisis planning tool**
- 2) Provide an Operational Effects Prediction tool**
- 3) Access Data in Near Real Time**
- 4) Be interoperable with current (and evolving) COE-compliant C4ISR and other systems**
 - GCCS- M / AF / A /J, JC2, and JEM**
- 5) Be Net-Ready**



JOEF Schedule – Increment I



AoA: Analysis of Alternatives
AR: Accreditation Review
BAA: Broad Agency Announcement
CDR: Critical Design Review
DT: Developmental Testing

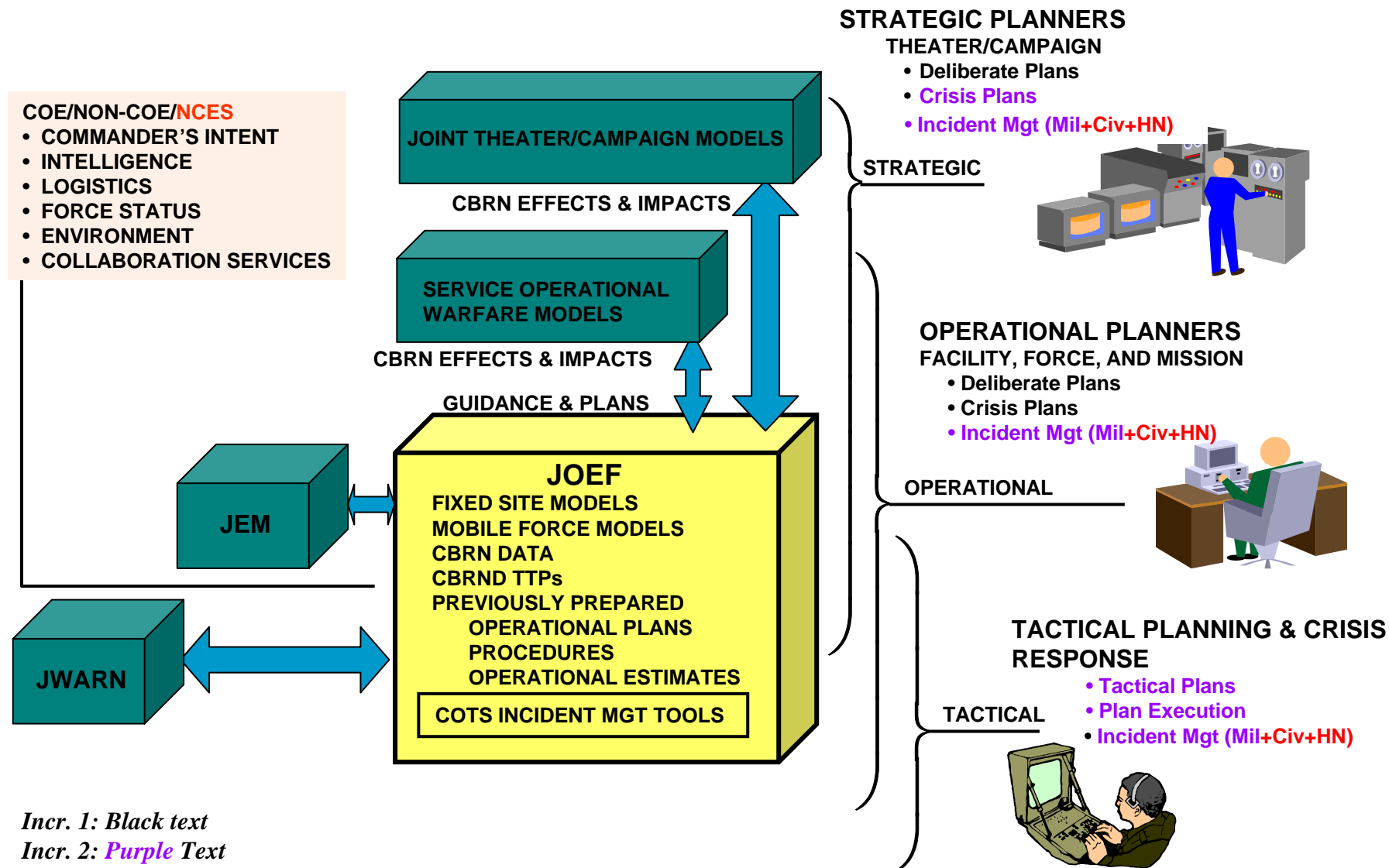
FOC: Full Operational Capability
FTA: Focused Technology Assessment
IA: Information Assurance
IOC: Initial Operational Capability
IOT&E: Initial Operational Test & Evaluation

IPR: In-Process Review
IV&V: Independent Validation & Verification
MS: Milestone
OA: Operational Assessment
OT: Operational Test
OTRR: Operational Test Readiness Review

P: Prototype
PCR: Program Change Request
PDR: Preliminary Design Review
SRR: SW Requirements Review
SW: Software
V V & A: Verification, Validation & Accreditation



Initial JOEF Concept



Incr. 1: Black text

Incr. 2: Purple Text

Incr. 3: Red Text



JOEF Spiral Development Increment I

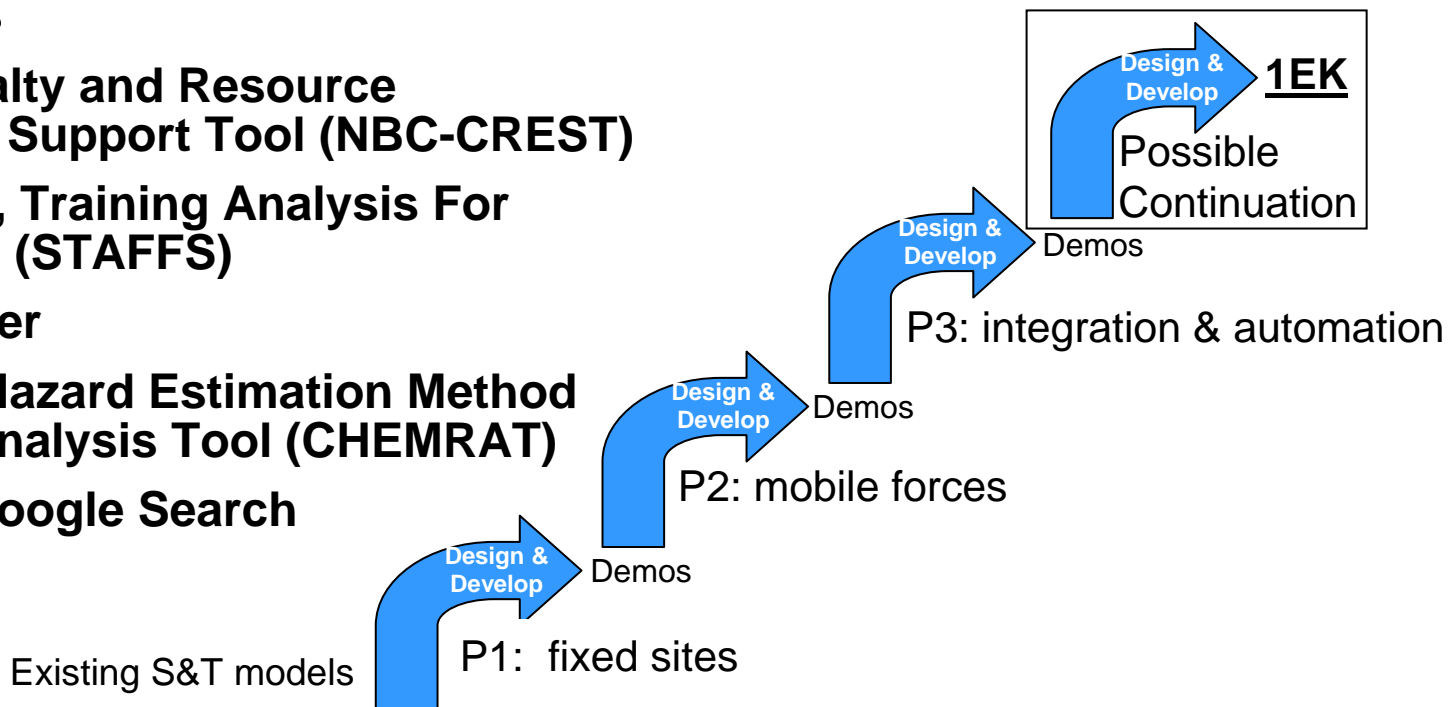
Prototype development – 3 cycles completed

- Objectives

- Explore technologies
- Demonstrate concepts
- Solicit Feedback / Clarify User requirements

- Components

- NBC Casualty and Resource Estimation Support Tool (NBC-CREST)
- Simulation, Training Analysis For Fixed Sites (STAFFS)
- NBC Planner
- Chemical Hazard Estimation Method and Risk Analysis Tool (CHEMRAT)
- Bonita & Google Search





JOEF Prototype Demonstrations

- **Purpose**

- Introduce concept and stimulate user community
- Solicit feedback and service-unique processes
- Clarify user requirements

- **Demonstrations:**

Operational Commands

DEMONSTRATIONS			
CENTCOM	I-Corps	NORTHCOM	PACAF
PACOM	TRANSCOM	USARPAC	3 rd Fleet
SDDC			
PLANNED			
EUCOM	PACFLT	STRATCOM	USFK

Conferences

DEMONSTRATIONS			
AUSA	CBIS	FPED	HPAC
I/ITSEC	SOCOM	WWCC	



JOEF Spiral Development

SDD: 3 Increments with multi builds in each increment

JOEF Inc	User Level	Deliberate Planning	Crisis Planning	Incident Response & Consequence Management	
		C4ISR Environment	C4ISR Environment	Site	C4ISR Environment
I	Strategic	COE/C2PC			
	Operational	COE/C2PC	COE/C2PC		
	Tactical				
II	Strategic	Standalone	COE/C2PC Standalone	Military	COE/Standalone
	Operational	Standalone	Standalone		
	Tactical	COE/C2PC Standalone	COE/C2PC Standalone		
III	Strategic			Civilian	COE/Standalone
	Operational				
	Tactical				



Open Systems Architecture

- **Separates the application layer from the services and engine layers**
- **Allows modification of GUI, JWARN, JEM without requiring updates to other parts of the JOEF software**
- **Allows modification of models without “breaking” the interfaces to the application layer**
- **Use CBRN Data Model and DISA Metadata Registry**



Technology Transition

- **PMO working closely with Chuck Fromer, Joint Science and Technology Office (JSTO)**
- **PMO monitoring S&T offerings for potential sources of technology transition**
- **JOEF Open Architecture will allow easy insertion of new capability**
- **JPM IS Programs of Record are the DoD acquisition path for JSTO**



JOEF Technology Challenges

- **Optimization Algorithms**
 - Robust sensor placement tool for CBRN staff users
 - Extend to other resource allocation and placement
- **Mobile Forces**
 - Capture CBRN effects on “combat power”
 - Operational Models & Calculators
- **Operational Impact Data Collection & Simplification**
 - Survey and characterize sources
 - Identify essential elements and resolution/detail
 - Collection, certification, and maintenance methodology
- **Campaign/Theater Models**
 - Federate detailed CBRN mission-level models with theater/campaign-level warfare models (JICM, JWARS, etc)



JOEF Technology Challenges

- **Integrate additional effects**
 - Radiological
 - Nuclear
- **Medical Resource Limitation Effects**
 - Effective treatment policies
 - Casualty/resource trades for mass casualty operations
- **Secondary Infection Models**
 - Communicable diseases
 - Sensitive to defensive plans/policies
 - Vaccination, quarantine, etc.



JOEF Technology Challenges

- **Task Automation for CBRN Staff**
 - **Examples**
 - Vulnerability and risk analysis
 - Identification and ranking of threats
 - **Methodology and tools to generate decision support checklists and templates**
- **Agent Fate**
 - Exposure risk vs. time and protection in all environments
 - TIC/TIM models
- **Innovative Embedded Training**



JOEF Status

- **On track for entry to Software Development and Demonstration (SDD) phase**
- **SDD contract process on track – Award expected Nov 05**
- **Continued dialog with warfighters to gather user requirements/feedback**

Visit us at the JPM IS booth to see the latest JOEF prototype



Presented to

CBIS 2005

CAPT Tom O'Keefe, USN
JPM Information Systems
Joint Program Executive Office
for Chemical and Biological Defense
Thomas.O'Keefe@jpmis.mil

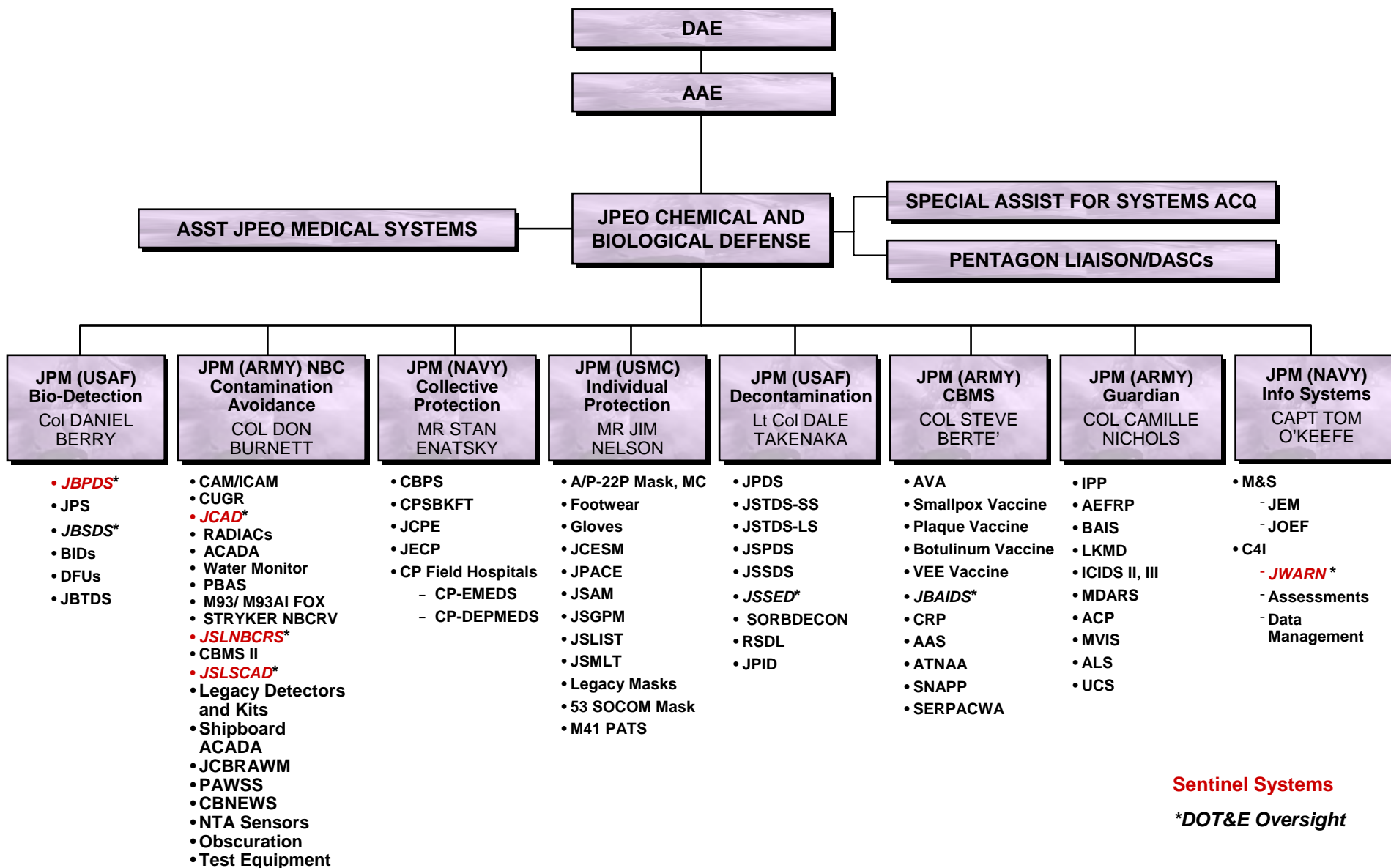


Agenda

- **JPM IS Overview – CAPT Tom O’Keefe**
- **JEM – Mr. Thomas Smith**
- **JOEF – Dr. Jerome Hoffman**
- **JWARN – Mr. Chuck Walker**
- **JPM IS Integrated Systems Architecture – Mr. Kevin Adams**



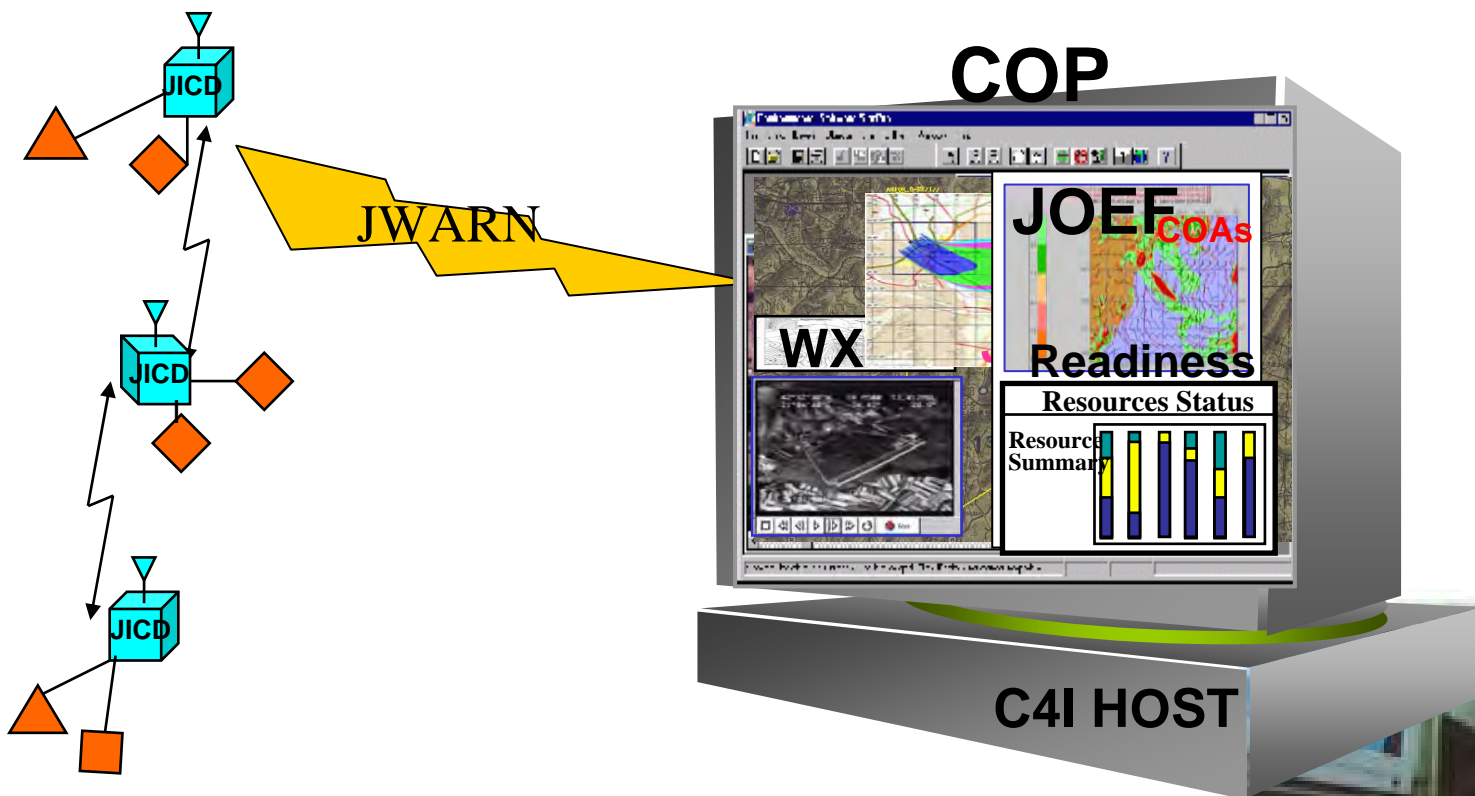
Joint Program Executive Office For Chemical And Biological Defense





CBDP - Program Overview

End-to-End Capability



- JWARN warns and reports
- JEM calculates plume, given agent and WX
- JOEF assesses mission impact/provides COA analysis
- Result: Enhanced timely/seamless C4I-based situational awareness of CBRN events

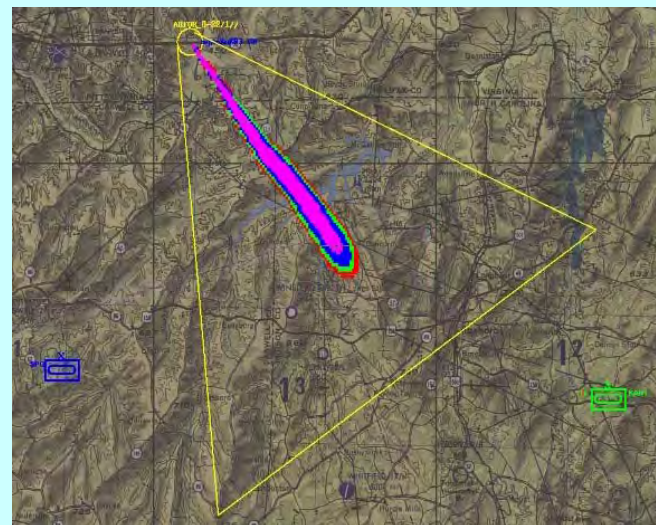




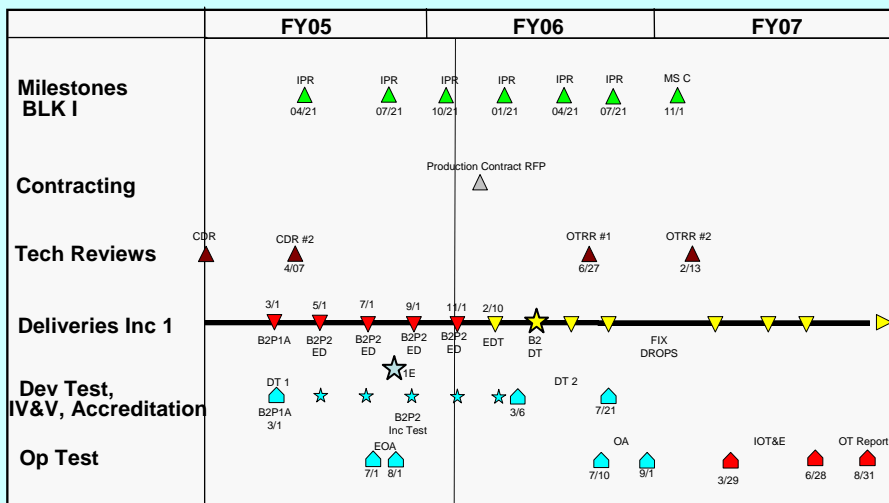
Joint Warning and Reporting Network (JWARN) Program Overview

DESCRIPTION

- JWARN is an ACAT III (Sentinel and Oversight Program) information system that networks NBC sensors, mission application software tools, and C4ISR systems
- JWARN builds on current manual capabilities by fully integrating with COE-based and tactical C4ISR systems
- Automatically generates alerts for warning and dewatering affected forces
- Automatically generates hazard area plots



SCHEDULE

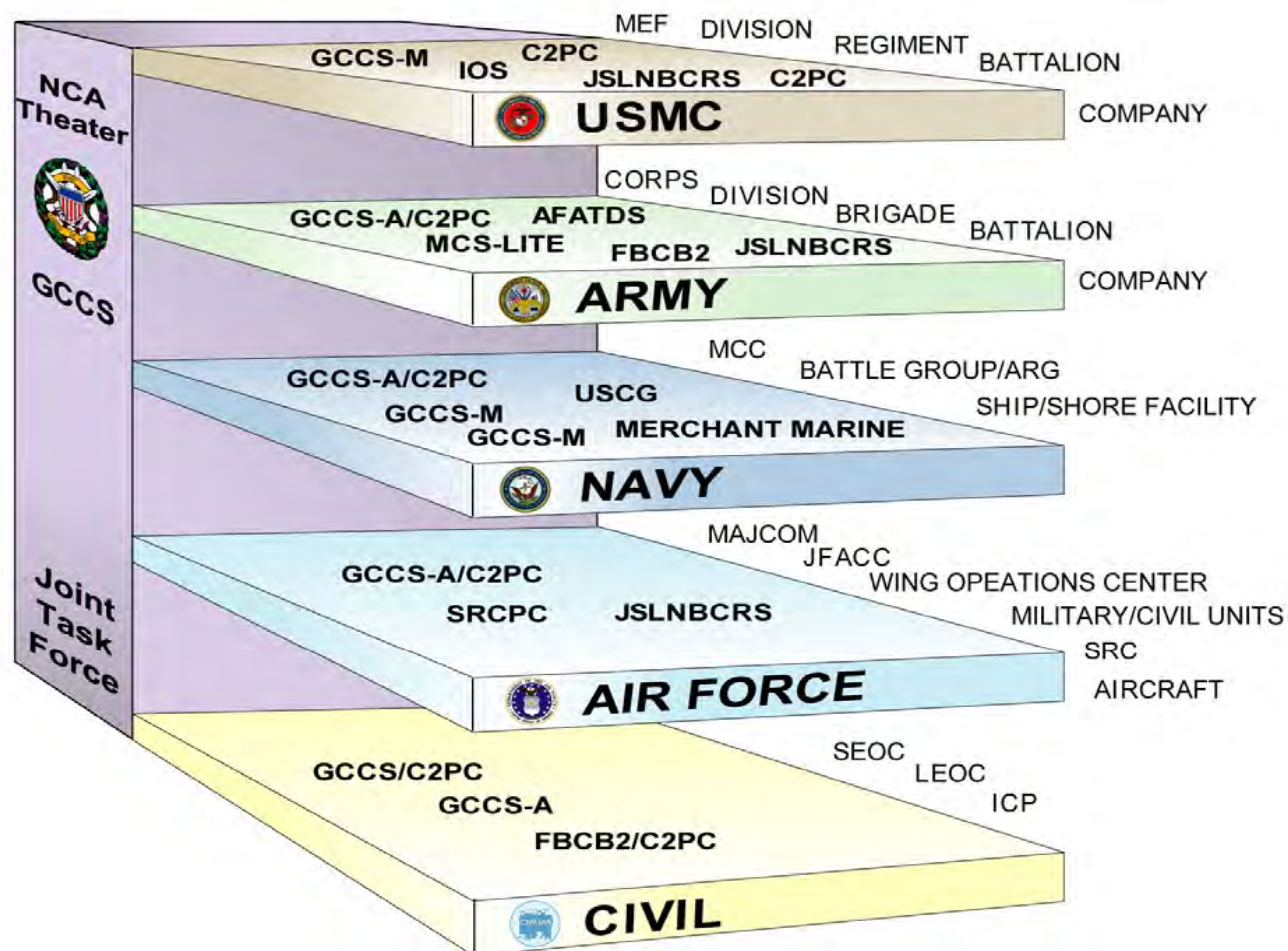


REQUIREMENTS

- Collect, generate, edit and disseminate NBC reports and plots and provide a means of ensuring all addressees have received a sent message
- Application support for MCS, AFATDS, FBCB2, C2PC, GCCS-J, GCCS-M, GCCS-A, and GCCS- AF COE Level 7 / DODIIS
- Allow NBC reports (NBC-1/NBC-4) to be formatted and transmitted within 2 minutes and allow operator selection of automatic, delayed or on-command sending of NBC reports
- Automated sensor interfaces for M8A1, M21, M22, IPDS, ADM 300, AN/VDR2, JBPDS



JWARN Connects NCS to the Foxhole





JWARN Functional Description

- **Enhanced NBC situational awareness**
 - Integrated with Joint and Service C2 systems
 - Battle management applications
 - Route planning
 - Obscurant planning
 - Heat stress calculation
- **Automatic generation of alerts**
 - Sensor to C4ISR host connectivity
- **Automatic generation and display of hazard area plots**
 - ATP-45
 - HPAC
 - VLSTRACK
- **Automated warning and dewarning of units within the hazard area**
 - Reduces time from incident to warning from over 30 minutes to less than 2 minutes
- **Provides the means to configure, monitor, and manage sensor network**
 - JWARN Component Interface Device (JCID) provides the physical connectivity to sensors
 - Wired or wireless network

Will be replaced by JEM



JWARN Initial Capability (JIC)

- Operational prototype with complete sensor-to-C4ISR functionality
- Purpose:
 - Support early Warfighter involvement with JWARN, Joint Effects Model (JEM), and Joint Operational Effects Federation (JOEF) technologies
 - Support of User Interface requirements
 - Support User Assessments (UA)
 - Support Technical Demonstrations and Experiments
 - Support early Integration and Data Management of an integrated System
 - Provide a venue to validate and refine Measures of Performance (MOPs) and Measures of Effectiveness (MOEs)
 - Provide an opportunity to refine the Joint CONOPS and Tactics, Techniques, and Procedures (TTPs)
- Currently installed at:
 - MCTSSA, Camp Pendleton, CA
 - Army Chemical School, Fort Leavenworth, MO
 - Langley AFB, VA

Operationally relevant platform for exercise support



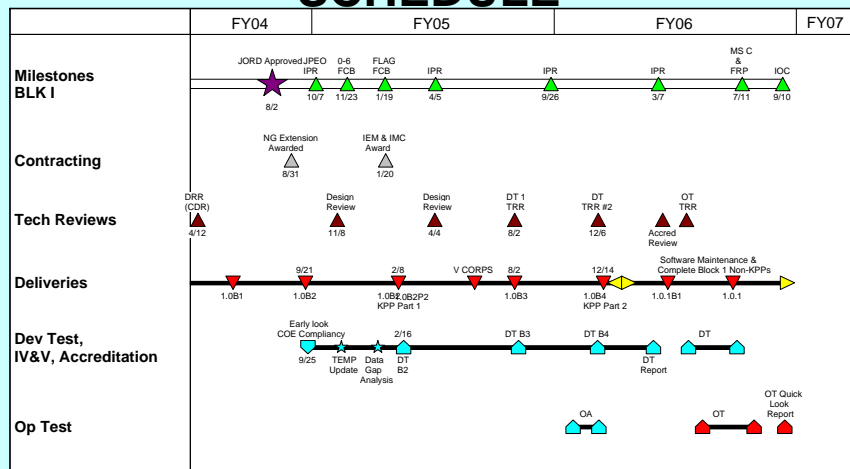
Joint Effects Model (JEM) Program Overview

DESCRIPTION

- JEM is an ACAT III Program that will provide a single, validated capability to predict the transport and dispersion of Chemical, Biological, Radiological and Nuclear/Toxic Industrial Hazard events and their effects
- JEM will be accredited for all uses currently supported by the three interim accredited DoD S&T Hazard Prediction Models
- JEM will be integrated with service Command & Control Systems and will also be available as Standalone



SCHEDULE



REQUIREMENTS

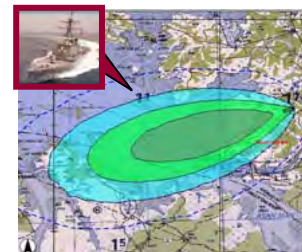
- Integrate VLSTRACK, HPAC, and D2PUFF capabilities
- Urban effects modeling
- High altitude missile intercept effects modeling
- High altitude weather effects and precipitation
- Improved transport and diffusion methodologies
- Waterborne Hazards
- Contagious Disease Modeling
- Complex structures
- Building interiors
- Human performance degradation



JEM Functional Description

CBRN / TIC / TIM Hazard Effects Modeling on C4I systems will support:

- **Consideration of Environmental Effects in *Strike Planning***
 - Significant potential of hazard creation and down wind effects resulting from strikes
 - Mitigate troop impacts
 - Mitigate friendly nation impacts
- **Rudimentary *Missile Defense* Support with initial fielding, advanced support with first update**
 - C4I System interoperability sends the Intercept Point possibilities to decision aid
 - Decision aid for “When to shoot” choices that minimize the post intercept effects
- **Actively supports *Force Protection / maneuver* requirements**
 - Supports force protection planning
 - Decision aid for increasing/decreasing MOPP levels
 - Enables decisive maneuver decisions
- **Supports *Special Operations***
- **Provides high fidelity *Consequence Management* information**
 - Focuses the response
 - Reduces area to concentrate decontamination and treatment efforts



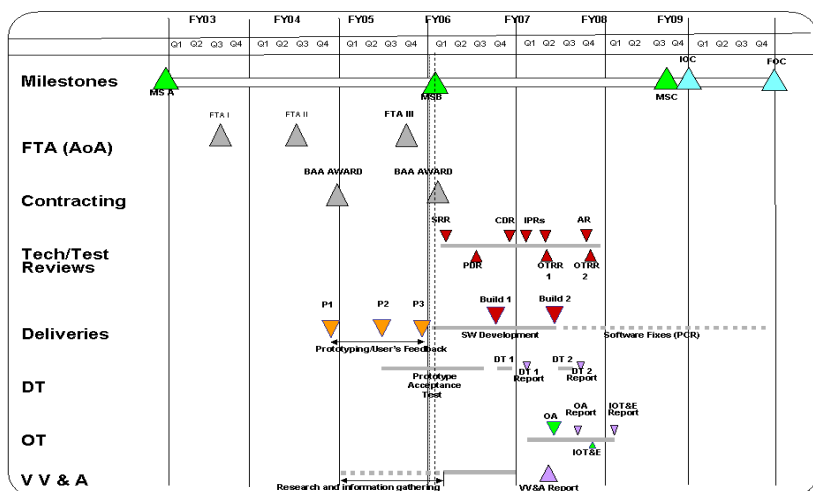
JOEF Program Overview

DESCRIPTION

- JOEF is an ACAT III Modeling & Simulation Program that will provide the Joint Warfighter a model based CBRN decision support information system that will:
 - Estimate hazardous effects on personnel and operations
 - Support advance and operational planning
 - Integrate with other CBDB models
 - Deploy on C2 systems of all services



SCHEDULE



REQUIREMENTS

- Fighter Bases Aerial Port of Debarkation (APODs)
- Sea Port of Debarkation (SPODs)
- Mobile Forces
- Automated Tactics, Techniques, and Procedures (TTPs)
- Medical
- Consequence Management



JOEF Functional Description

- **Fighter Bases Aerial Port of Debarkation (APOD)s**
 - Assess the effects of CBRN on sorties, materiel throughput, use of Mission Oriented Protective Posture (MOPP) gear
- **Sea Port of Debarkation (SPODs)**
 - Assess the effects of CBRN on cargo throughput, logistics, medical casualties, MOPP gear
 - Safety and decontamination for SPODs and other land based ports, such as depots
- **Mobile Forces**
 - Combat power
 - Avoid contamination and impede adversary planning
 - Sensor placement/optimization
 - Dispersion to reduce target value
- **Automated Tactics, Techniques, and Procedures (TTPs)**
 - User friendly access to CBRND procedures
 - Basis for decision logic in warfare operations
 - CBRND process automation
- **Medical**
 - MEDEVAC plans
 - Resource management
 - Casualty estimates
- **Consequence Management**
 - Supports trans-attack and post-attack actions
 - Incident management and hazard control
 - Planning, operations, logistics, and finance/administrations



Points of Contact

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thomas.O’Keefe@jpmis.mil

CAPT Scott White, Deputy JPM IS

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phillip.hornick@navy.mil

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robert.Walker@jpmis.mil

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Mr. Thomas Smith, JEM APM

(858) 537-8677

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Dr. Jerry Hoffman, JOEF APM

(858) 537-0125

jerome.Hoffman@navy.mil



Environmental Hazard Prediction Thrust Area Overview

John Pace

*Joint Science and Technology Office
Defense Threat Reduction Agency*

*CBIS S&T Conference Plenary Session
25 October 2005*



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Environmental Hazard Prediction



- Why we're here: Warfighter support through technical improvement of JEM, JWARN, JOEF
 - Primarily supporting JEM
- Are dispersion models good enough?
 - Need for continued progress in dispersion modeling and related work *in particular areas*
- Program structure focused on known limitations in dispersion modeling capabilities



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Environmental Hazard Prediction

Thrust Area Evolution



- Past: DoD environmental hazard S&T performed mostly independently by DTRA, Navy, Army
 - Lack of coordination within DoD
 - Duplication in some areas
 - No capability or programs in other areas
- Last year: Began to coordinate efforts
 - Developed S&T plan, addressing joint program needs
 - Began developing, managing projects to address key areas
- Current: Integrated programs leveraging capabilities across DoD, collaboration with US govt, universities, companies, foreign countries
 - Meeting CBBDP needs, reducing duplication of effort



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Environmental Hazard Prediction

Thrust Area Objectives



- Objective: Provide technological capabilities to meet stated requirements in CB defense programs
- Provide *core system* capabilities, *enabling* capabilities
- *Core system*: components of JEM, JWARN, JOEF
- *Enabling*: provide data needed by JEM, JWARN, JOEF to function
- Requirement: Ensure technological capabilities are in place to enable JEM, JWARN, and JOEF to work, when called for by development schedules



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Environmental Hazard Prediction Program Components

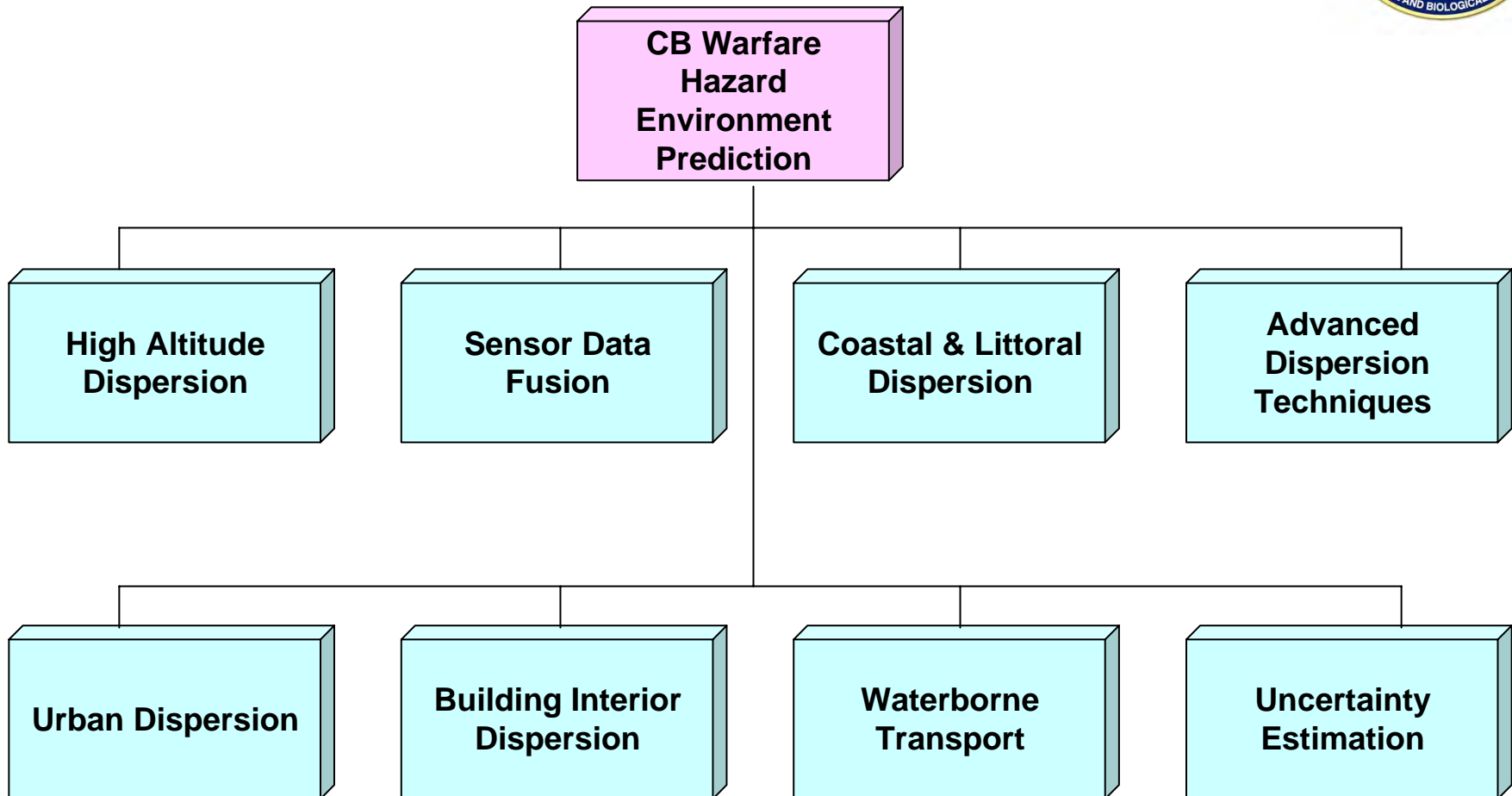


- Program management
- Technical guidance and support
- **Model development and acquisition**
- Enabling capability coordination
- Experimental data
- System integration
- Technology transition



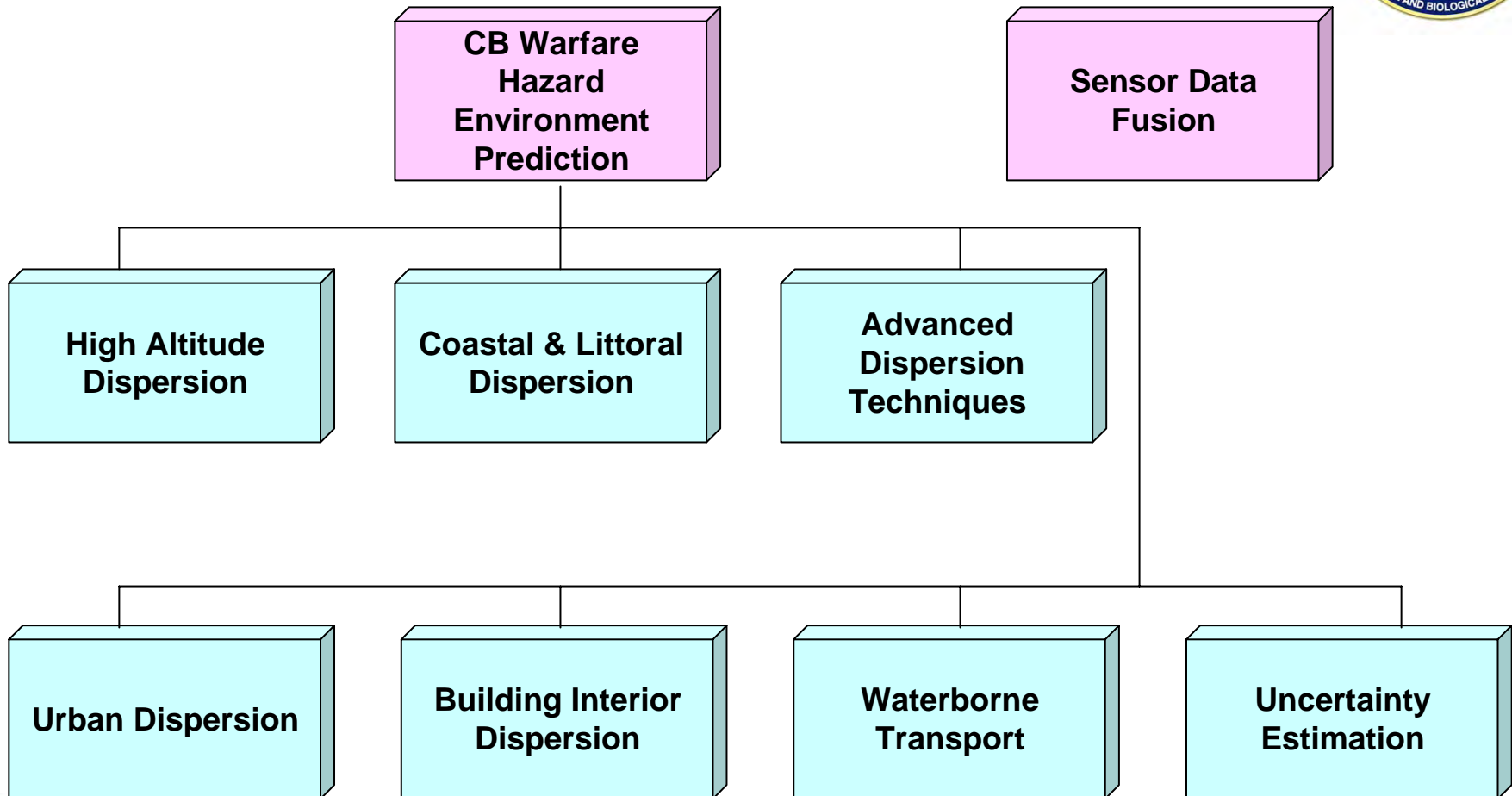
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CB Warfare Hazard Environment Prediction Thrust Area Focus Areas



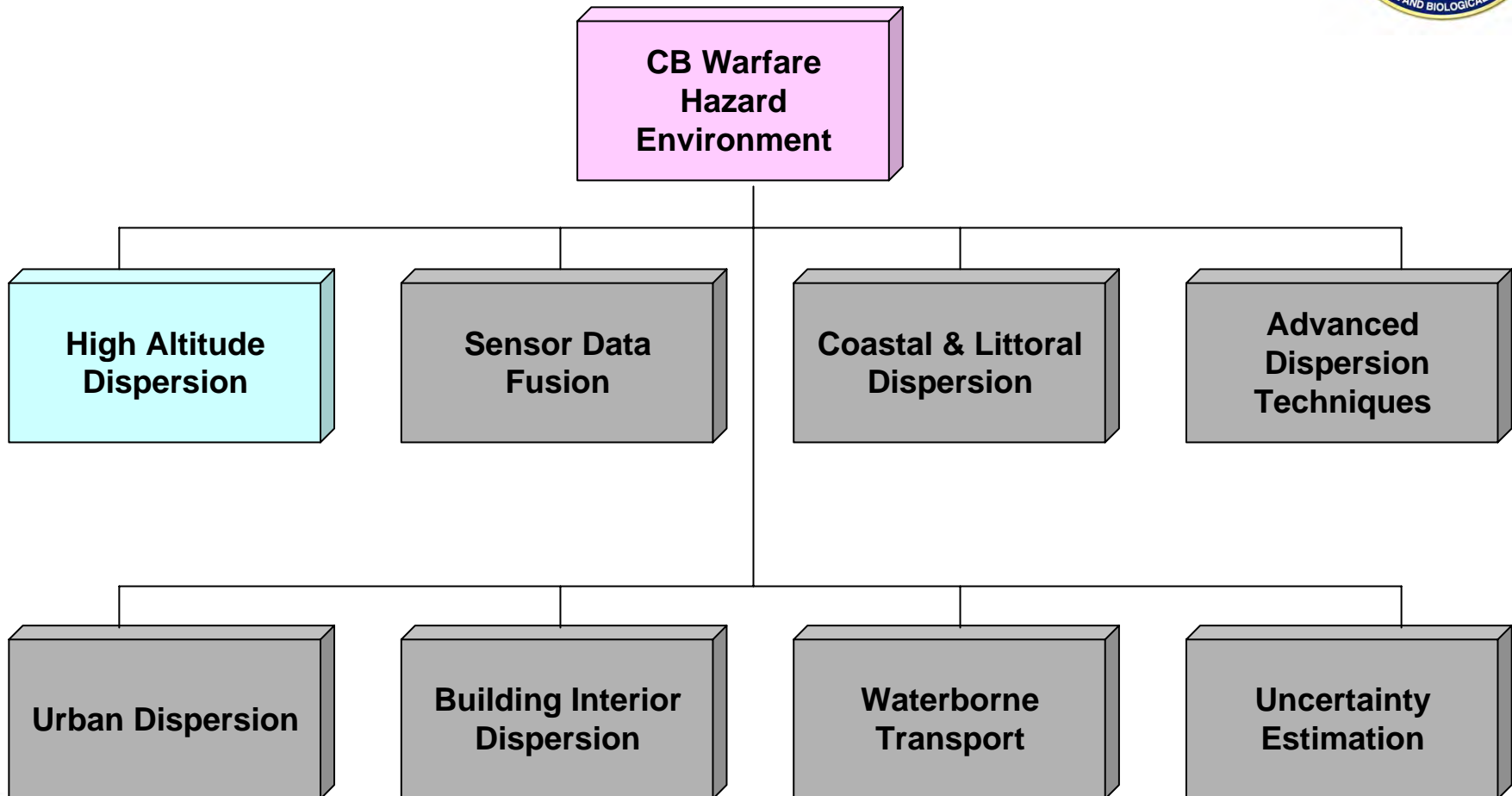
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Future Structure – Split Thrust Area



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CB Warfare Hazard Environment Prediction Thrust Area Focus Areas



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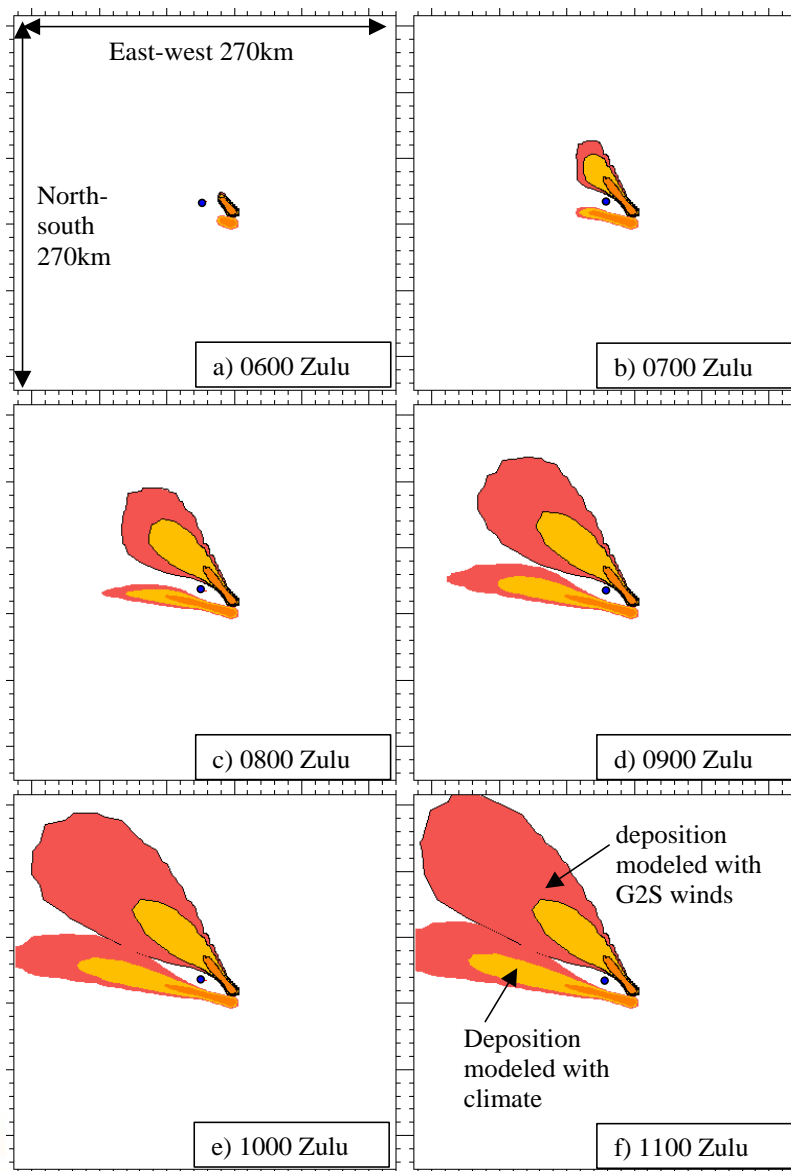
Missile Intercept Modeling



- JEM Block II requirement
- Very different from modeling in lower atmosphere
 - Thin atmosphere, different turbulence characteristics, uncertainty about behavior and characteristics of released CB materials
 - Lack real-time weather predictions
- Missile intercept source term characterization
 - JSTO is funding program at LLNL/UCSB to address source term specification: *Release and Atmospheric Dispersal of Liquid Agents* (Thursday 1330)
- High-altitude weather
 - JSTO funded project at LLNL to evaluate impact of real-time weather data
 - results show significantly different ground deposition patterns
 - JSTO expects to fund 6.1 project beginning in FY06 to study connection between terrestrial and space weather

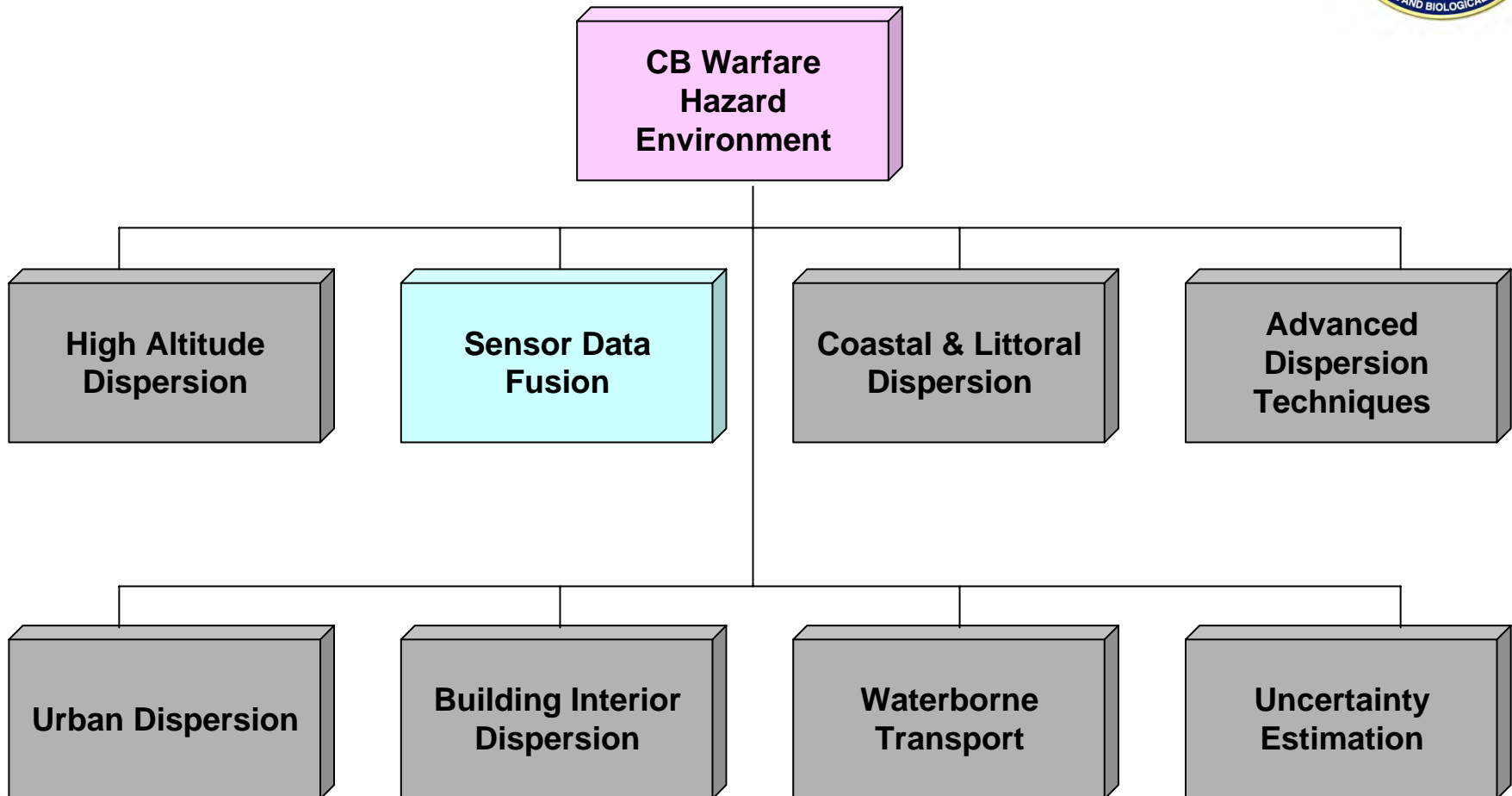


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Plan views of deposition contours hourly from 0600 to 1100 Zulu simulated with a US Navy high-altitude meteorological forecast dataset (contours outlined in black), and a US Navy high altitude climatological dataset (no contour outline). The blue dot marks the x-y location of the release point.

CB Warfare Hazard Environment Prediction Thrust Area Focus Areas



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Sensor Data Fusion



- Large program to improve dispersion modeling
 - Large increase in work projected for FY06
 - Supports both JEM and JWARN
- JSTO program coordinated with TP9/TP10 program
 - Coordinates several related projects, leverages UK programs
- Principle objectives:
 - Blend CB sensor data with dispersion model
 - More accurate depiction of CB hazard area
 - Ability to “backtrack” to source location
 - Provide guidance about sensor performance
 - Support tool to place sensors for facility protection
 - Future: Extend to fusion of meteorological data



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Sensor Data Fusion Presentations



- *Source Term Estimation (Dstl)*
 - Presentation, demo Wednesday 1055-1200
- *Fusion of CB Data and Model Output (Dstl)*
 - Wednesday 1300-1330
- *Chemical/Biological Source Characterization (DTRA)*
 - Wednesday 1330-1400
- *Optimizing Sensor Placement for CB Defense (NGIT)*
 - Wednesday 1400-1430
- *Sensor Location Optimization Tool Set (ITT)*
 - Wednesday 1430-1500
- *Overview of Mesoscale Modeling for Dispersion Applications (NRL Monterey) – Wednesday 1500-1530*



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Additional JSTO Sensor Data Fusion Projects



- Sensor Network Methodologies (NSWC Crane)
- Support to JSTO Sensor Data Fusion Program (NOAA)
- Beginning: Sensor Software Placement Suite (NSWC Dahlgren)
- Beginning: SCIPUFF Adjoint Model for Release Source Location from Observational Data (Aerodyne)
- Beginning: Data Assimilation for Chem-Bio Dispersion in the SCIPUFF/HPAC Computing Environment (UB/PSU) (6.1 project)



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Sensor Data Fusion – Illustration



- Same slides I showed last year – still the best way I have to show how SDF can provide better results than either sensors or models alone



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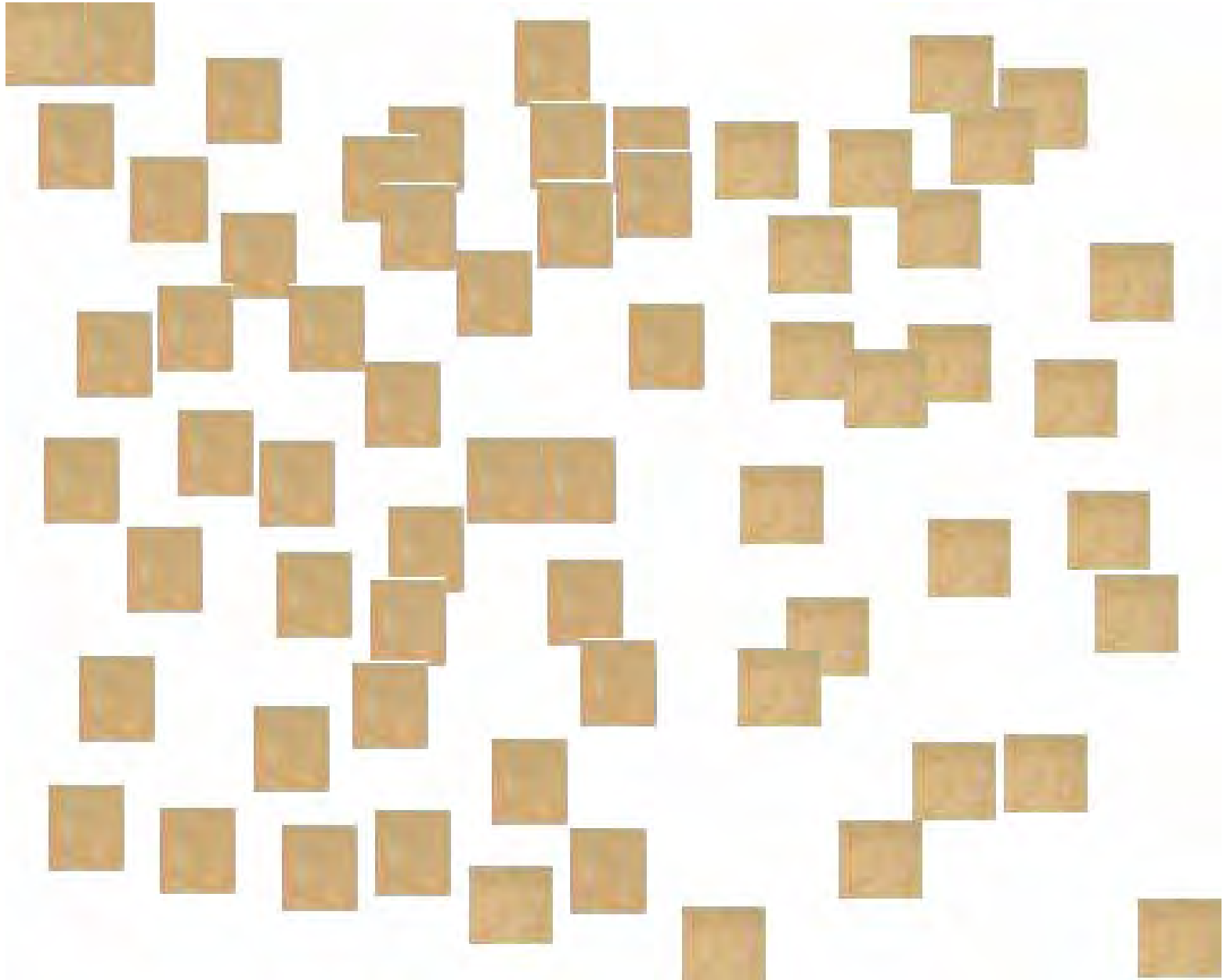
"Model" Results – not perfectly accurate



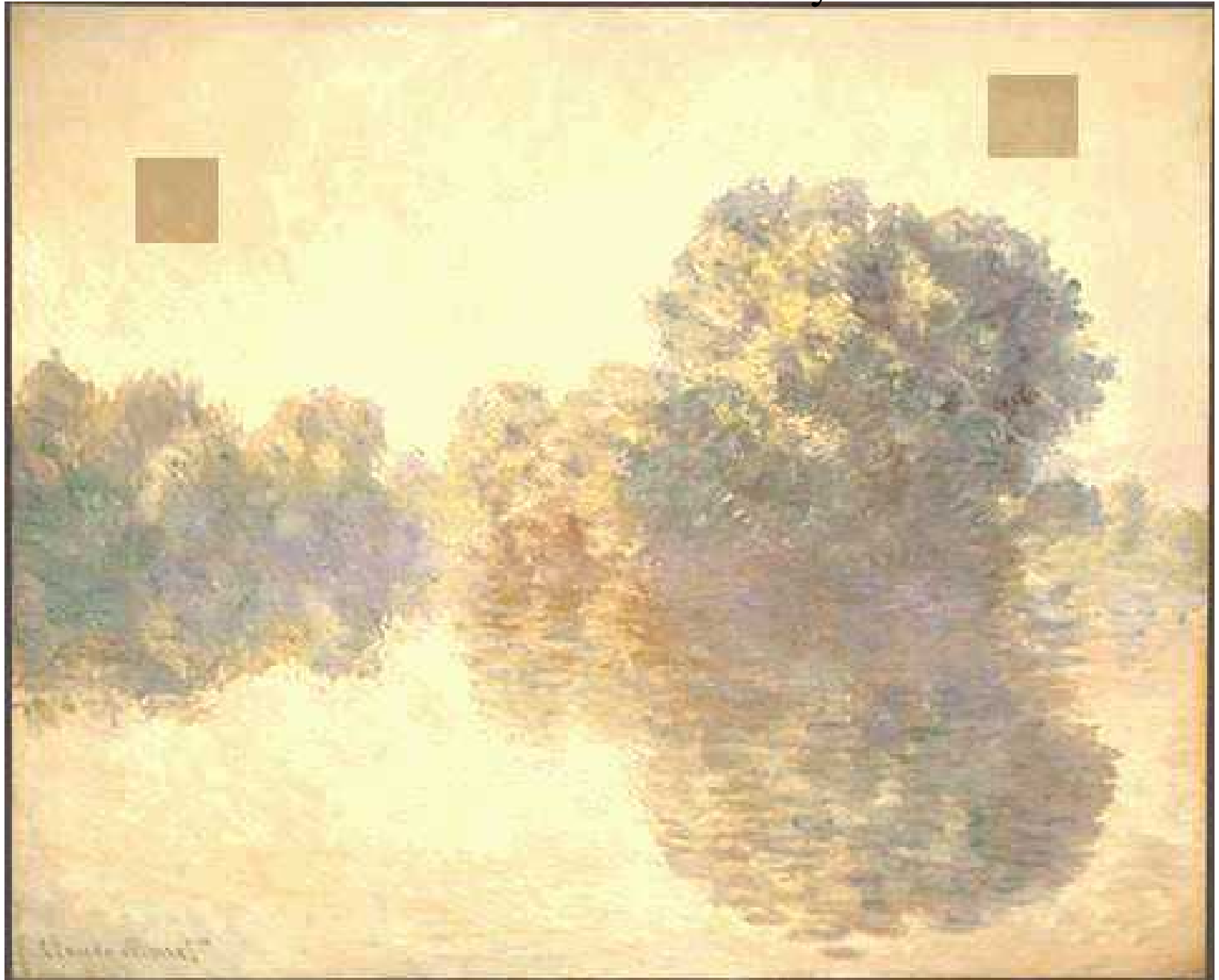
Sensor Data – provide only snapshots of hazard



Hazard depiction based on interpolation of sensor data



Data fusion? Not really.



Claude Monet

The Seine at Giverny, 1897



Jackson Pollock

Number 1, 1950 (Lavender Mist), 1950

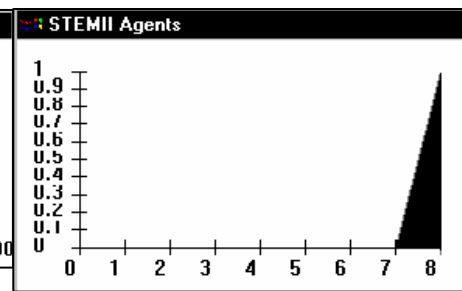
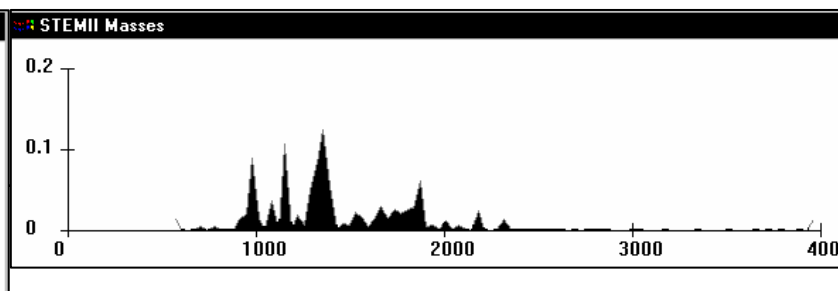
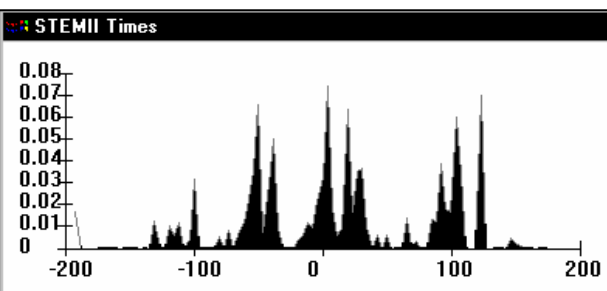
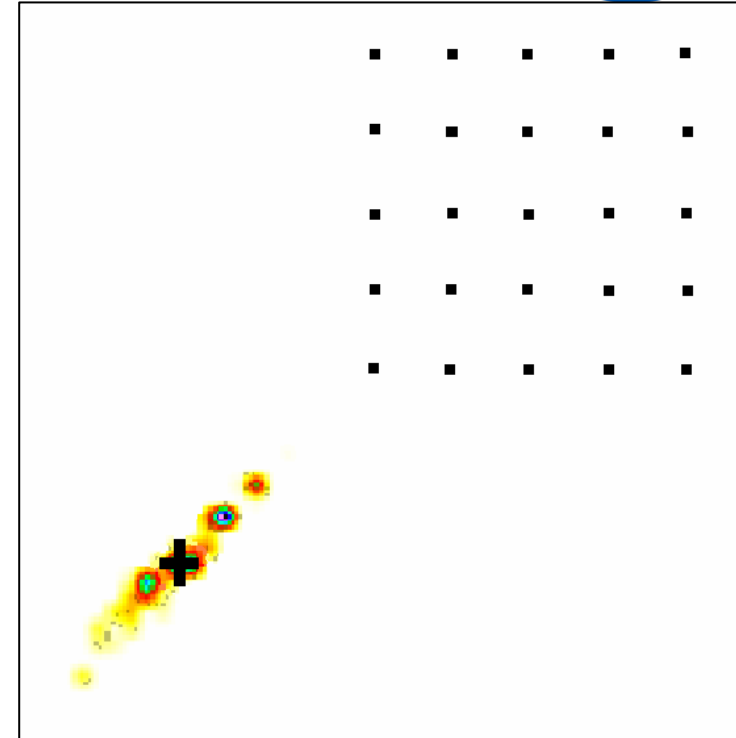
(The urban problem will be even more complex)



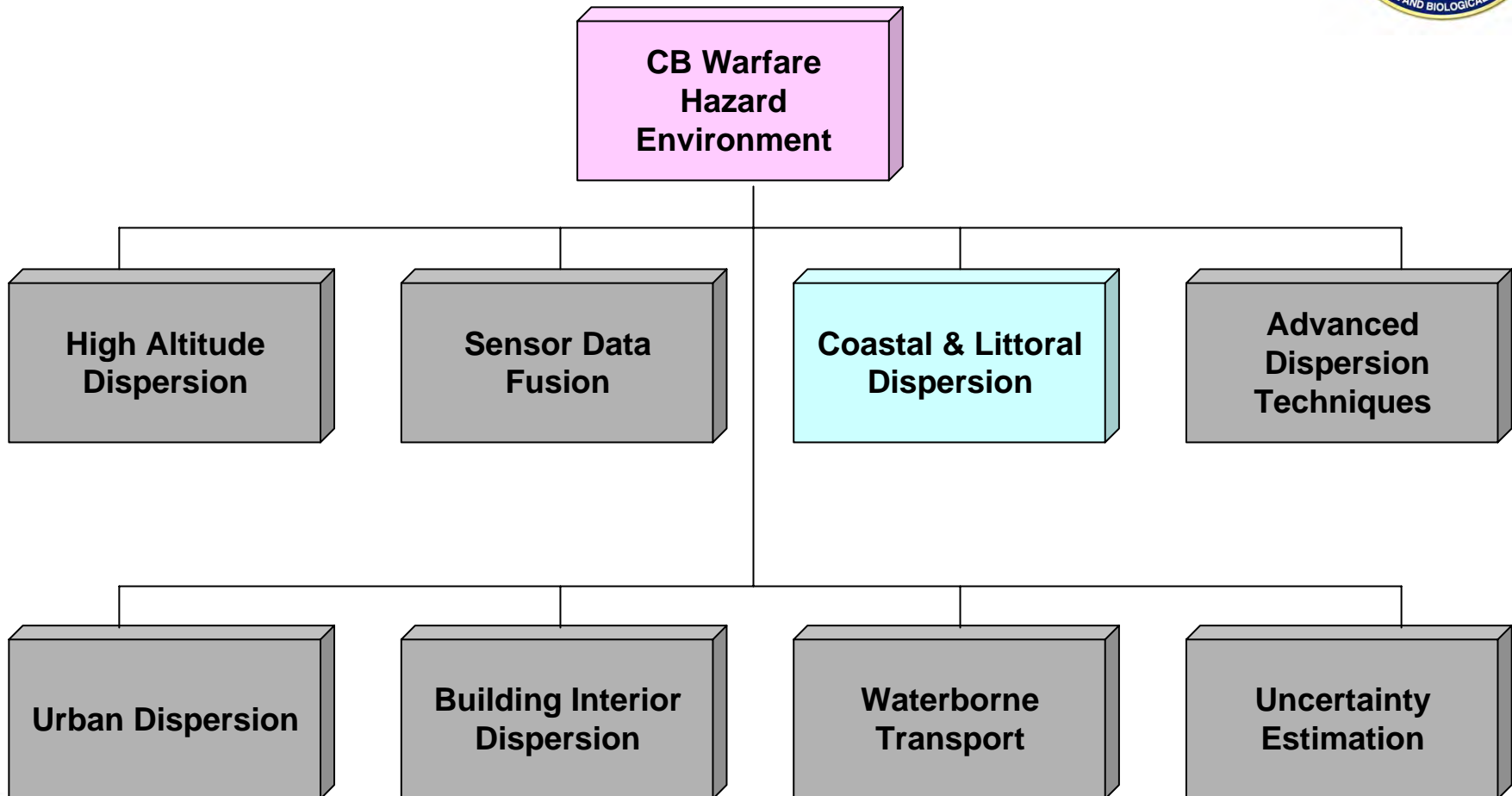
Prototype Backtracking Capability



- UK developed STEM-II
 - Updates source-term estimates in real-time
 - Robust Bayesian approach
 - Handles real-time chemical sensor data and observer data
 - Demonstration version available
 - Further development required, including
 - Multiple sources
 - Continuous and line releases
 - Biological releases



CB Warfare Hazard Environment Prediction Thrust Area Focus Areas



Making the World Safer

Coastal and Littoral Improvement



- JEM Block II requirement – also a key problem area
- Identified at least three ways to address this requirement
 - Use high-resolution weather data
 - Develop improved weather modeling and data assimilation systems to use more observations, including radar and other remote sensing, and develop coupled air-sea models
 - Improve boundary layer parameterizations
- JSTO program currently pursuing four C&L initiatives
 - Nowcasting DTO (NRL Monterey) directly relates to this requirement
 - Beginning: *Coupled Air-Sea Modeling for Improved Coastal Urban Dispersion Predictions* (NRL Monterey) (Thursday 1030-1100)
 - Link to radar propagation work, field tests at NSWC, NRL, NPGS. Beginning: *Measurement of Coastal & Littoral Toxic Material Tracer Dispersion* (NSWC Dahlgren) (Thursday 1100-1130)
 - NOAA/Kamada study using AF data from Cape Canaveral to identify sensing systems required for operational improvement, and to evaluate new boundary layer parameterization scheme

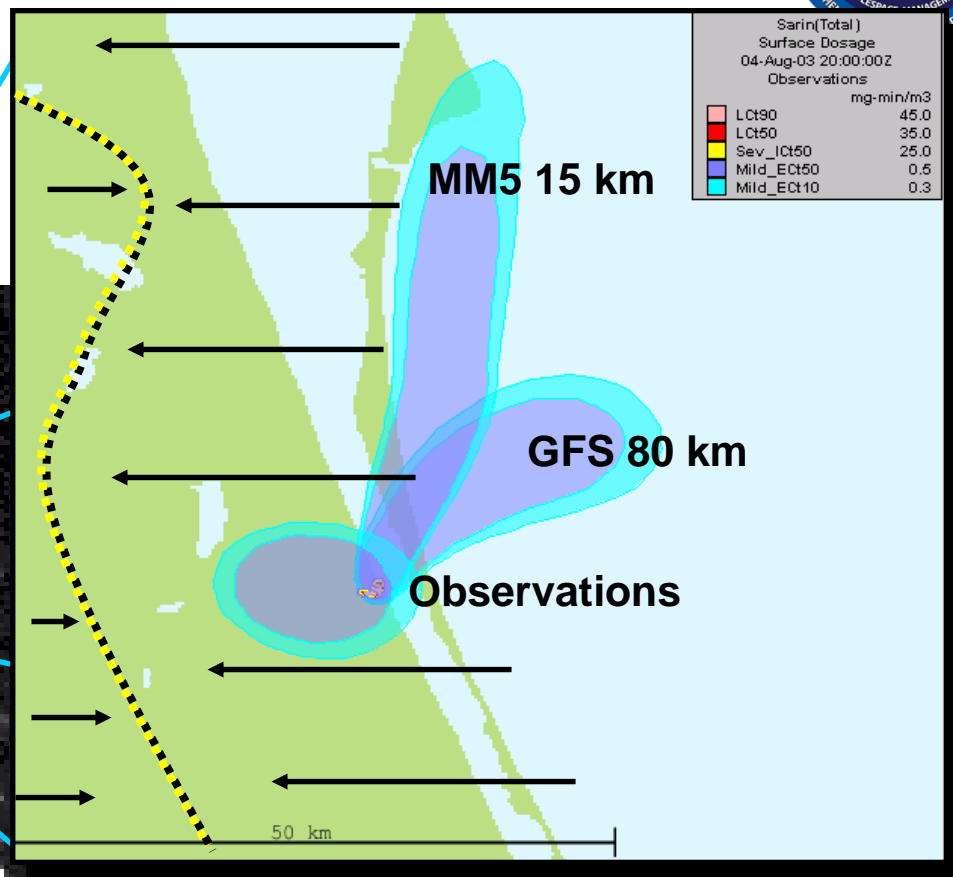
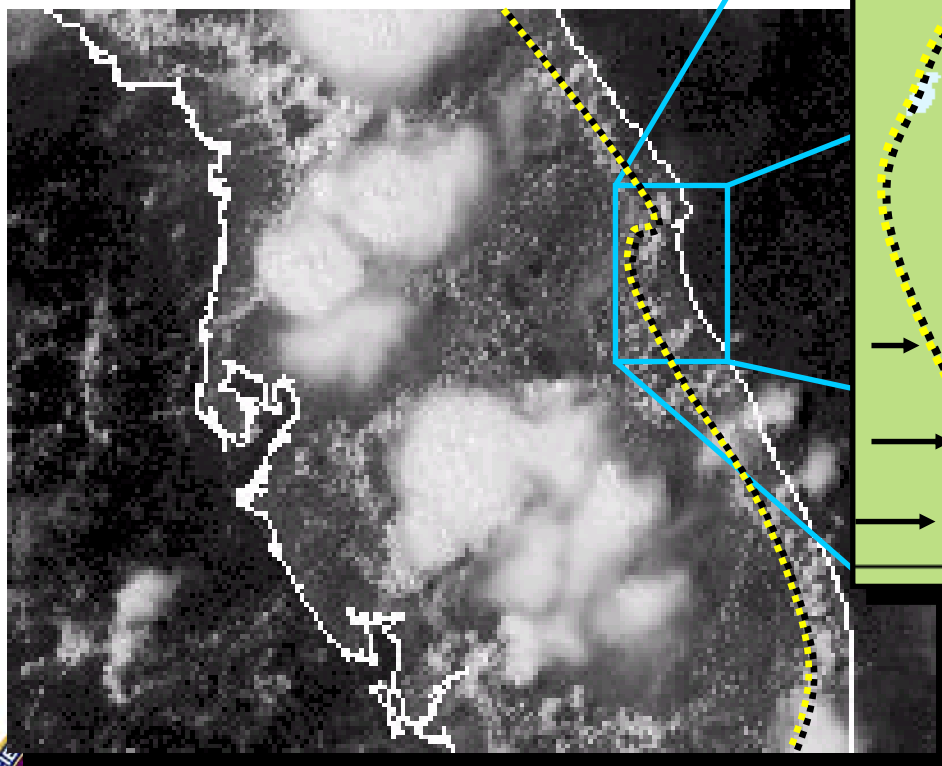


Making the World Safer

Weather Model Resolution Effects

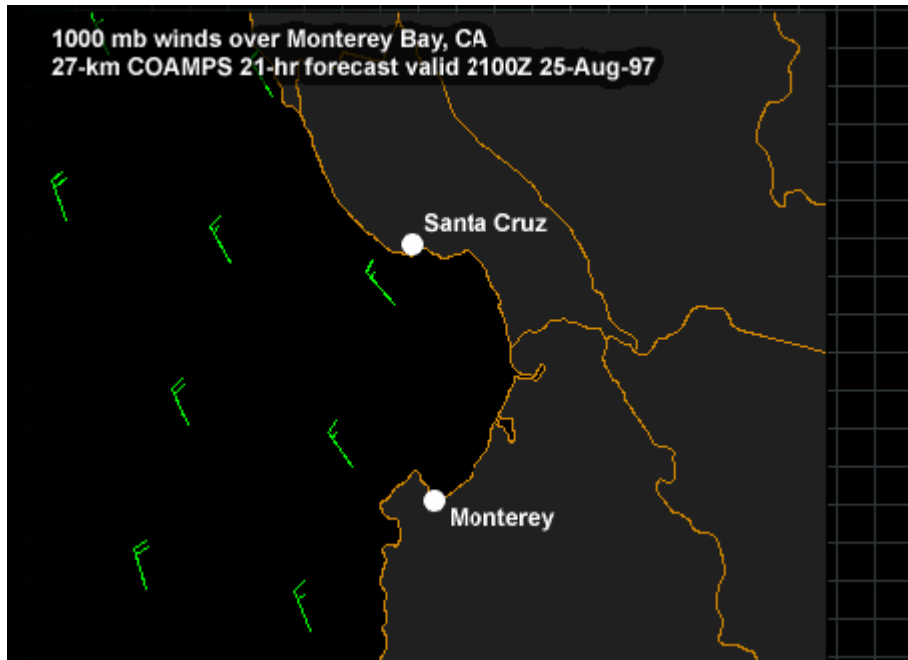


Coarse-resolution models
unable to resolve the sea
breeze circulation



Making the World Safer

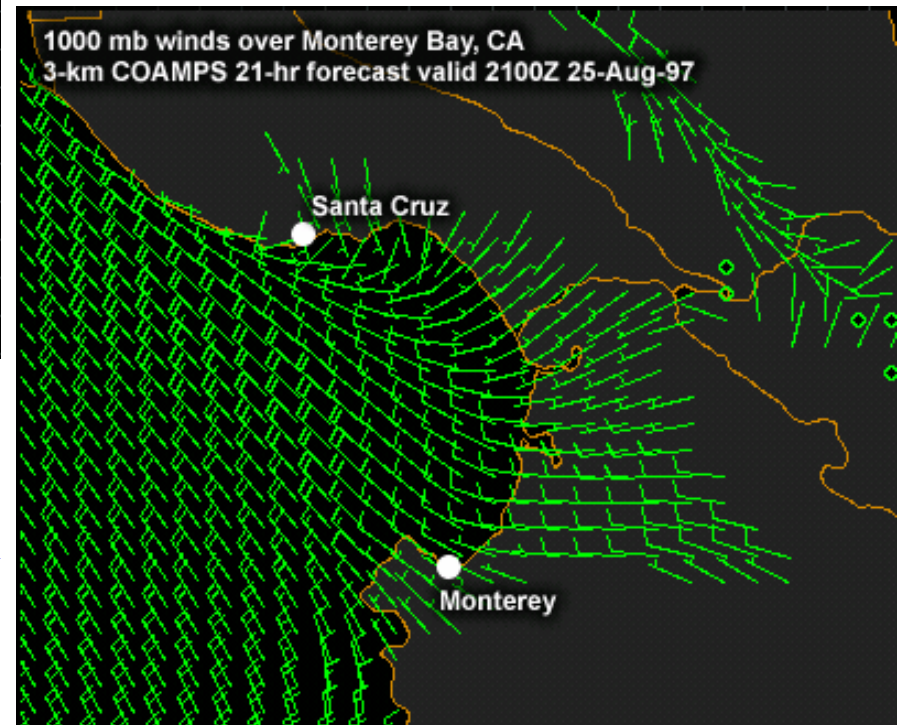
Illustration of Model Resolution Impact



Coarser resolution (27 km) reveals very little detail in the wind field

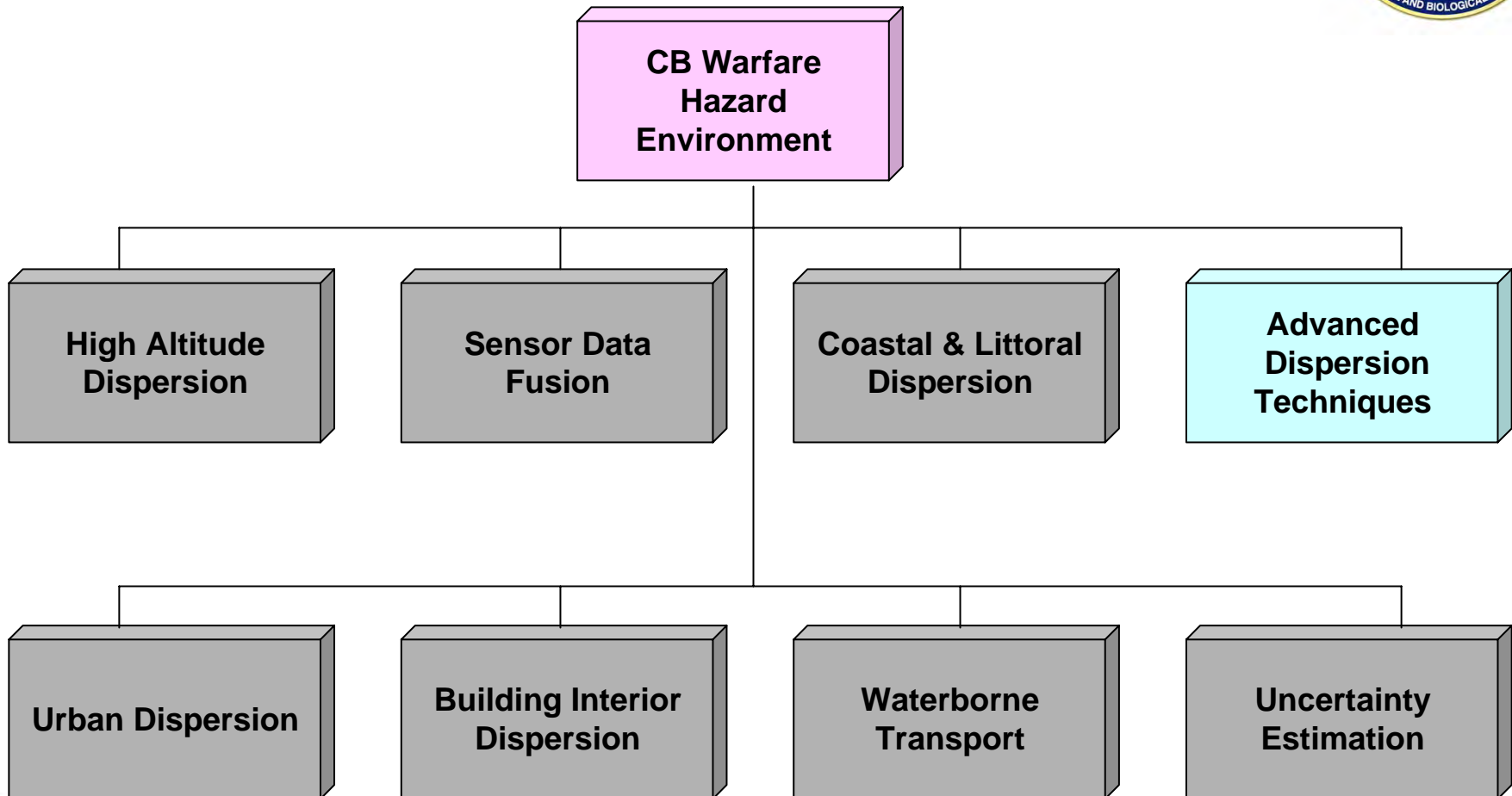


Higher resolution (3 km) reveals onshore flow of the sea breeze



Making the World Safer

CB Warfare Hazard Environment Prediction Thrust Area Focus Areas



Making the World Safer

Improvements in T&D Methodologies

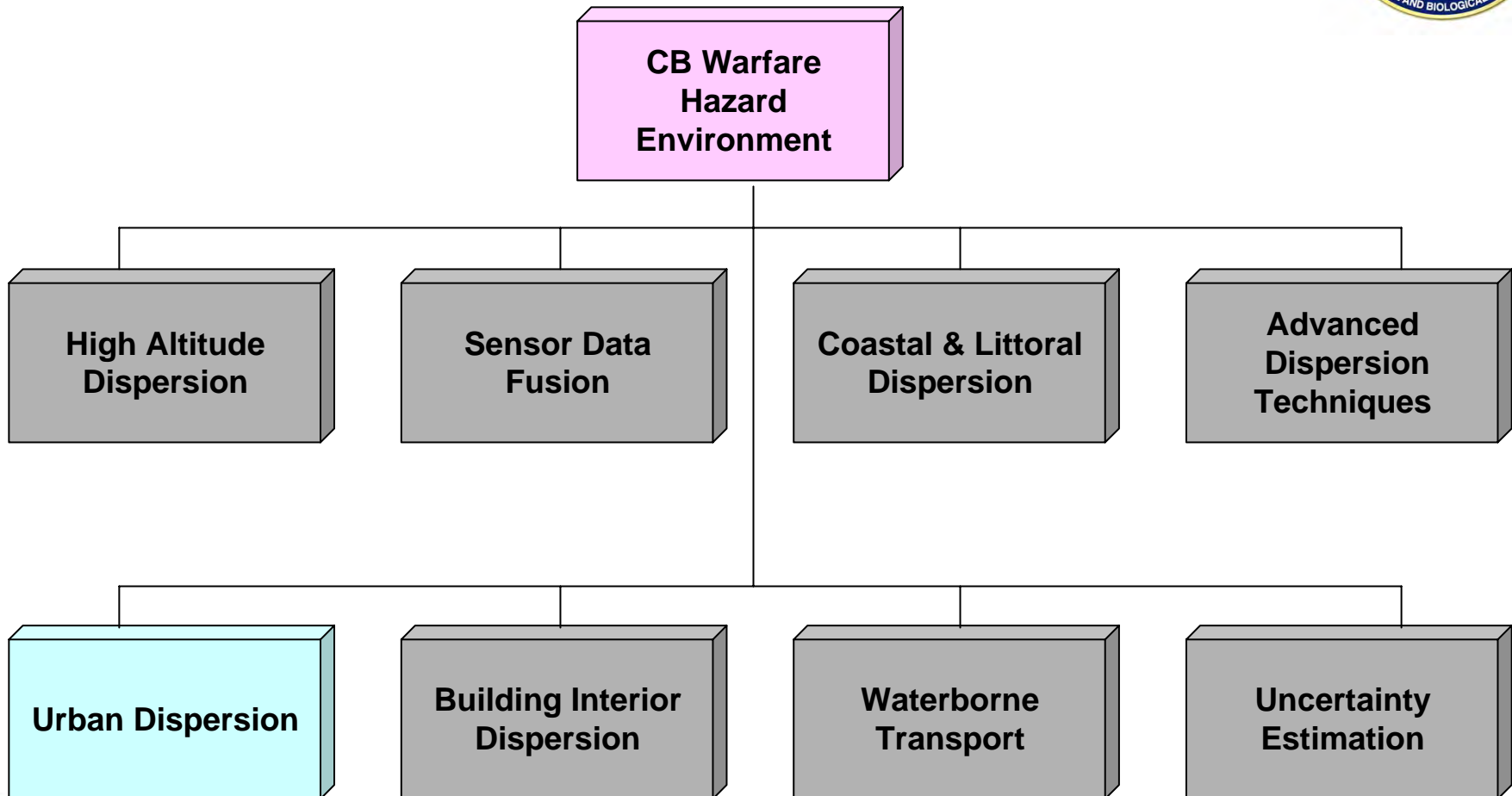


- JEM has Block II requirement to improve T&D methodologies when significant benefits will result
 - Many options: Add new models, improve source term models, improve parameterizations, make better use of weather or land-surface data, etc.
- Current Projects:
 - Developing MESO/RUSTIC as possible future component of JEM: *Chemical and Biological Hazard Environmental Prediction* (NSWC Dahlgren) (Thursday 0900-0930)
 - Supporting R&D in weather data assimilation (NRL Monterey)
- New Projects:
 - 6.1 project with Army Research Lab: Turbulence in the Stable Boundary Layer
 - 6.1 project with NCAR/PSU: Relationship of Boundary Layer Winds to Soil Moisture & Cloud Properties
 - Cellular Automata Exterior Hazard Assessment Tool (NSWC Dahlgren)
 - Modeling the Atmospheric Chemistry of TICs (DTRA)
 - Coastal and Littoral program (discussed earlier)



Making the World Safer

CB Warfare Hazard Environment Prediction Thrust Area Focus Areas



Making the World Safer

Urban Dispersion Modeling



- JEM Block II requirement – already many investments elsewhere – relatively little needed by JSTO
- Variety of urban wind and dispersion models available
 - One choice is to link models of difference scales:
Contaminant Transport and Dispersion Modeling in Urban Areas Using Coupled Mesoscale (WRF) and Urban Scale Models (CFD-Urban) (CFDRC) (Thursday 0930-1000)
 - UWM, UDM integrated into HPAC
 - JSTO is supporting development of MESO/RUSTIC
 - Initial JEM urban models will be selected by JPM-IS
 - Will need ability to predict CB agent concentration and atmospheric pressure on sides of buildings for link to building interior modeling



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Urban Dispersion Modeling (cont)

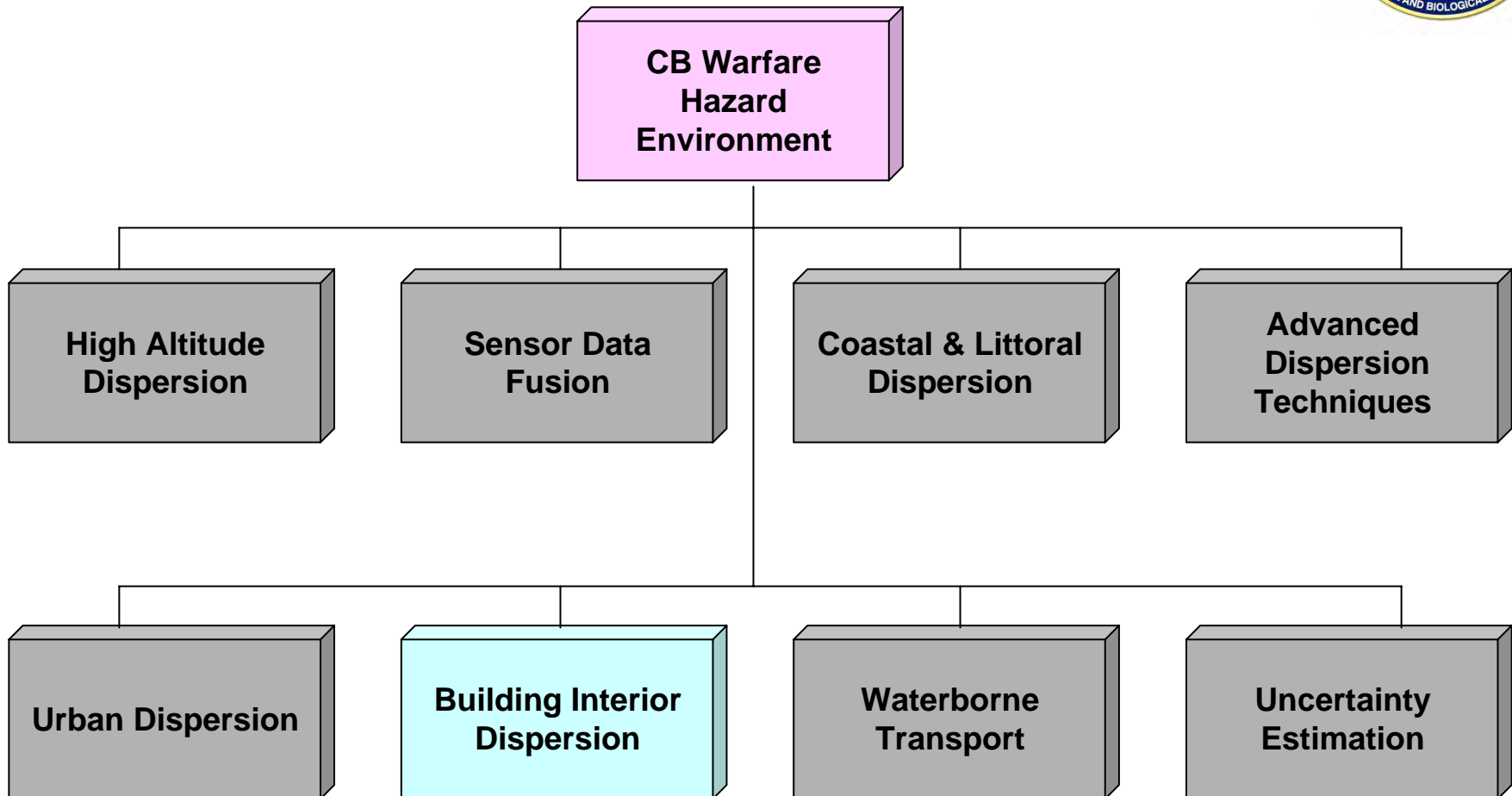


- Program Plans
 - Complete DTO developing MESO/RUSTIC
 - Proposed IPT to evaluate use of CFD models by JEM
- New Projects
 - Benchmark for Computational Modeling of Urban Flows (NRL)
 - Rapid Wind & Pressure Calculations Around Buildings (LANL)
- Field Studies
 - Urban 2000, MUST, Joint Urban 2003 datasets in widespread use
 - Considering future field studies
 - May conduct study to collect and use data from Pripyat, Ukraine (near Chernobyl) (Texas Tech)
 - May participate in field study near Helsinki Finland



Making the World Safer

CB Warfare Hazard Environment Prediction Thrust Area Focus Areas



Making the World Safer

Building Interior Dispersion Modeling

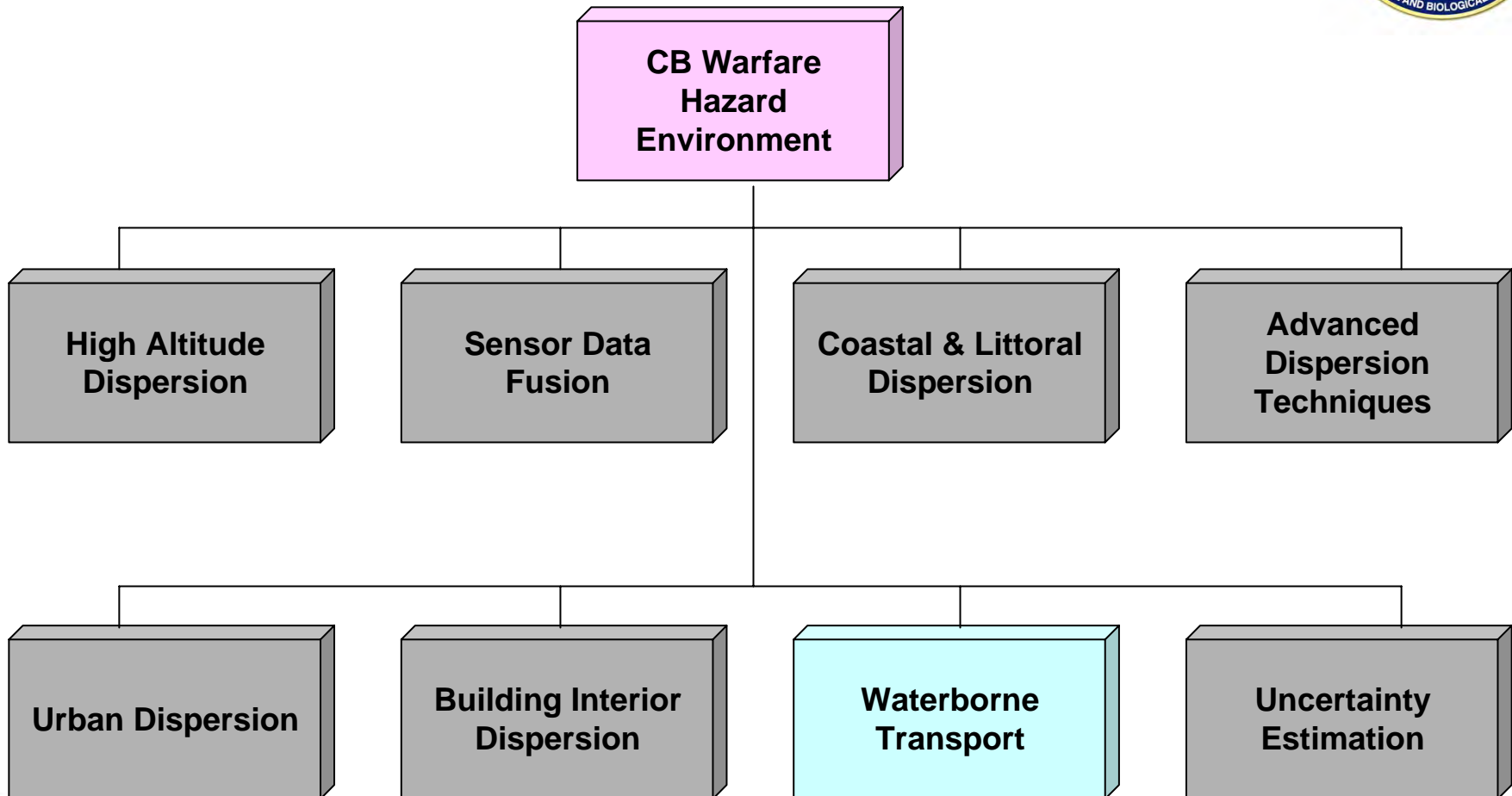


- JEM Block III requirement
- Some models already exist
 - Multi-zonal models (COMIS, CONTAM, MBLM) at LBNL, NIST, DTRA, DARPA, NSWC, SAIC
 - Coarse-grid CFD models for large rooms
- Newer types of models may become available
- Proposal to fund coordination of COMIS and CONTAM into next-generation multi-zonal model
 - Leverage DARPA's Immune Building Program, DTRA's BINEX capability, NSWC and DOE/DHS R&D programs
- Hope to coordinate with DHS
 - DHS making large investment in this area



Making the World Safer

CB Warfare Hazard Environment Prediction Thrust Area Focus Areas



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Waterborne Transport Modeling

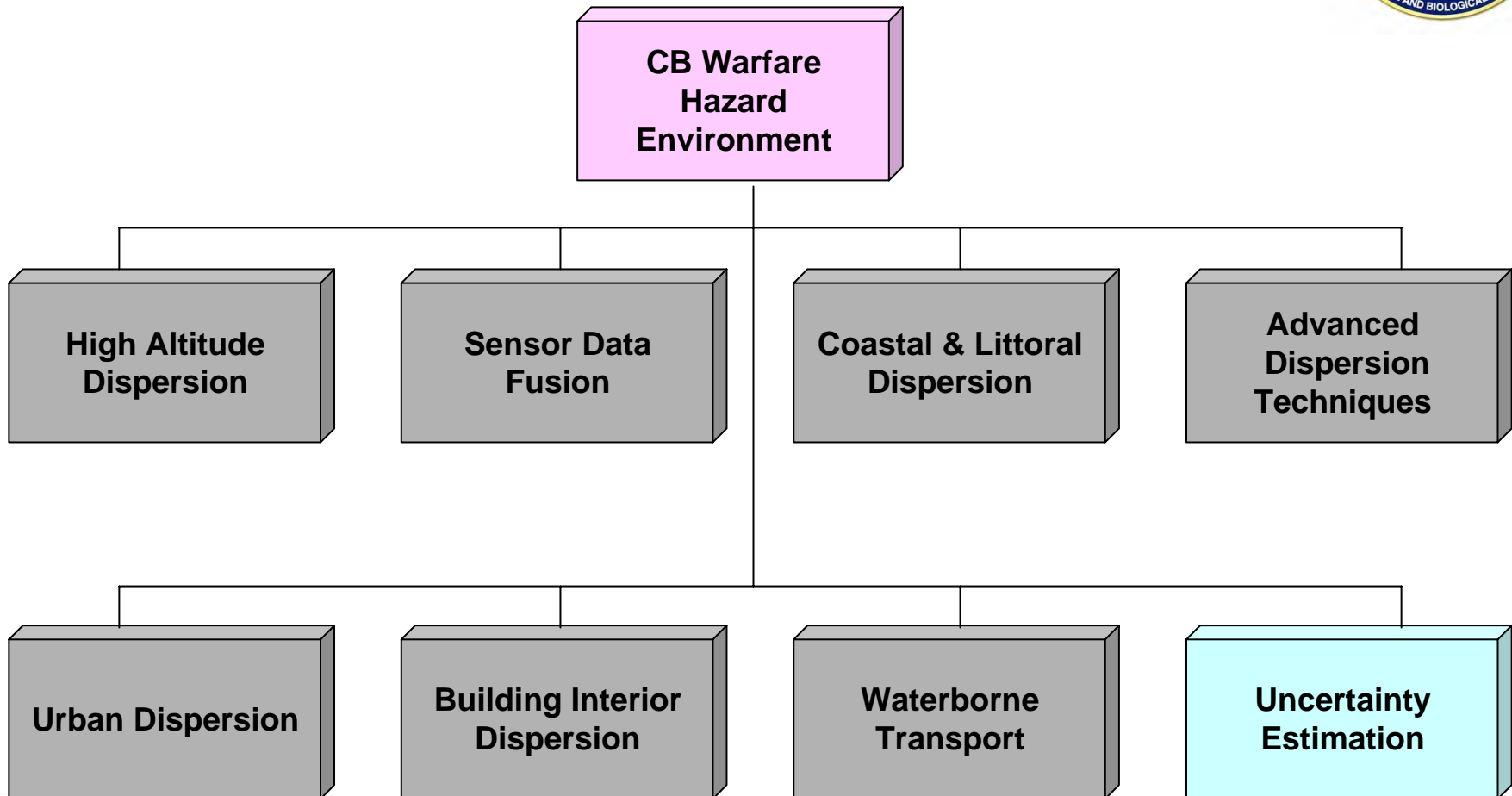


- JEM Block III requirement
- No active JSTO program in this area now
- Several programs underway elsewhere
 - Navy, ORNL, DTRA, DHS
- JSTO will watch other work and develop programs as needed



Making the World Safer

CB Warfare Hazard Environment Prediction Thrust Area Focus Areas



Making the World Safer

Uncertainty Estimation



- No active JSTO program in this area now



Making the World Safer

Performing Organizations



- Previous: NSWC Dahlgren, NRL Monterey, ITT
- Current: NSWC Dahlgren, NRL Monterey, ITT, DTRA, LLNL, UCSB, Dstl, NOAA, NSWC Crane
- Imminent (planned): NSWC Dahlgren, NRL Monterey, ITT, DTRA, LLNL, UCSB, Dstl, NOAA, NSWC Crane, NRL DC, NGIT, NASA, ARL, UB, PSU, NCAR, Aerodyne
- Possible Future: NSWC Dahlgren, NRL Monterey, ITT, DTRA, LLNL, UCSB, Dstl, NOAA, NSWC Crane, NRL DC, NGIT, NASA, ARL, UB, PSU, NCAR, Aerodyne, CFDRC, Titan, ARIA, LBNL, NPS, DPG, DRDC, NIST, DARPA, NASA, AFWA, Titan, ORNL, SAIC, DSTO, TTU, Vaisala...?



Making the World Safer

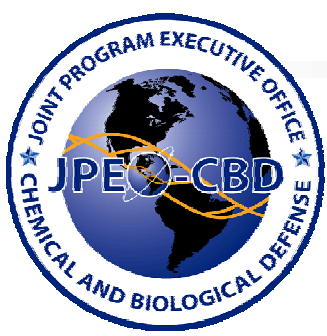
Summary



- Established comprehensive program to meet requirements, address weak areas, coordinate activities
- Brings S&T program into line with coordinated, unified model development programs
- Expect to see areas of particular expertise developed at DoD labs, R&D activities
- EPP budget increase provided opportunity to develop comprehensive, coordinated program



Making the World Safer

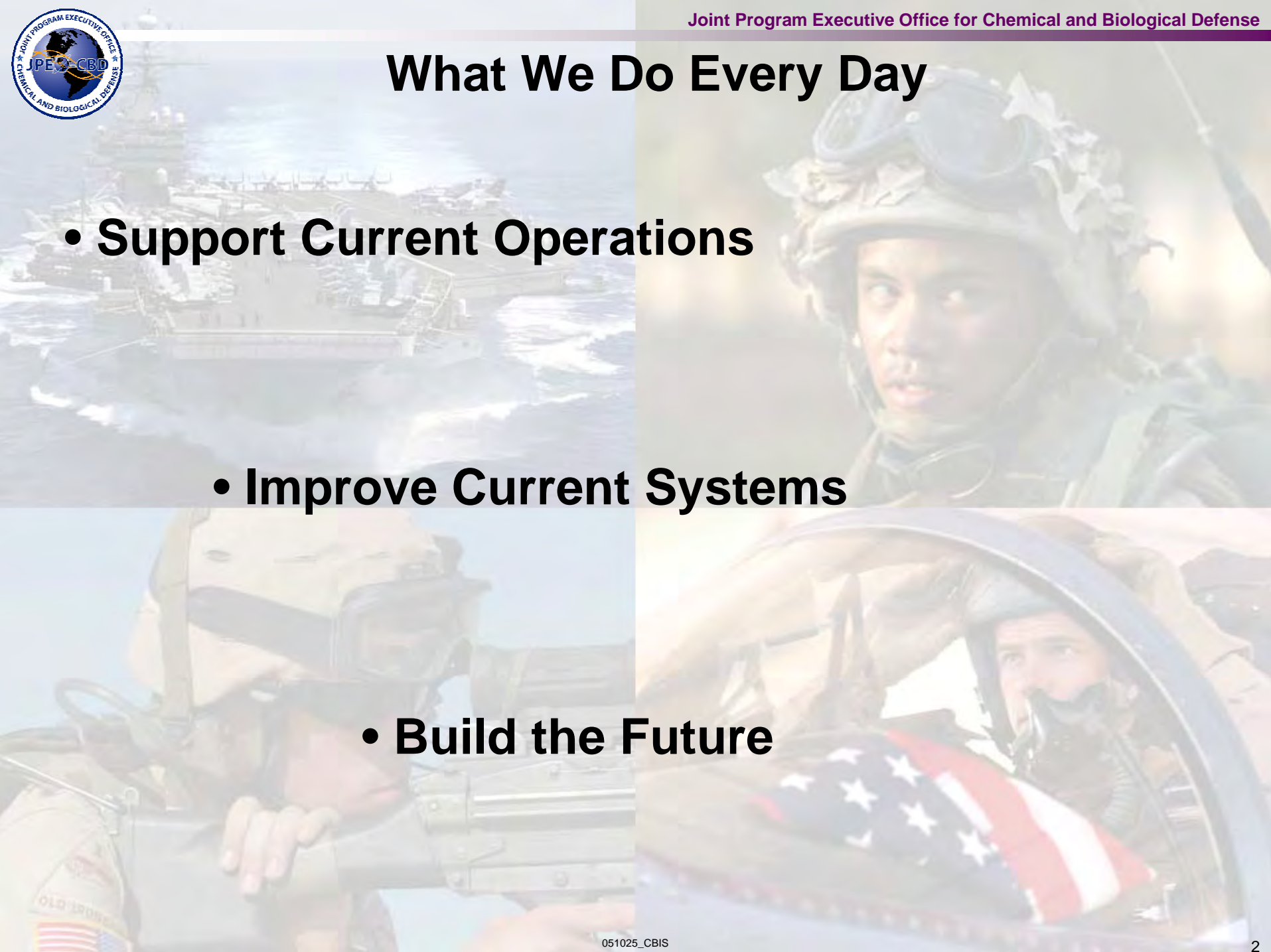


Systems Perspective on Information Systems

October 25, 2005

PRESENTED TO:
**Conference on Science & Technology
for Chem-Bio Information Systems
Albuquerque, NM
October 25, 2005**

**STEPHEN V. REEVES
Brigadier General, USA
Joint Program Executive Officer
for Chemical and Biological Defense
(703) 681-9600**



What We Do Every Day

- **Support Current Operations**
- **Improve Current Systems**
- **Build the Future**



Thoughtful Predictions

“I think there is a world market for maybe five computers.”

**— Thomas Watson
Chairman of IBM, 1943**

**“Computers in the future may weigh
no more than 1.5 tons.”**

**— *Popular Mechanics*
“Forecasting the Relentless March of Science”, 1949**

**“Who in their right mind would ever need
more than 640k of RAM!”**

— Bill Gates, 1981



Overview

- **Why We Are Here**

- **Operational Perspective**

- **Developing Joint Warfighting Capabilities**



Why We Are Here

Vaccines

Treatments

Diagnostics

Chemical & Biological Agent Detection

Individual Protection

Collective Protection

Decontamination

Weapons of Mass Destruction – Civil Support

Installation/ Force Protection

**Information
Systems**

Total Life Cycle Management

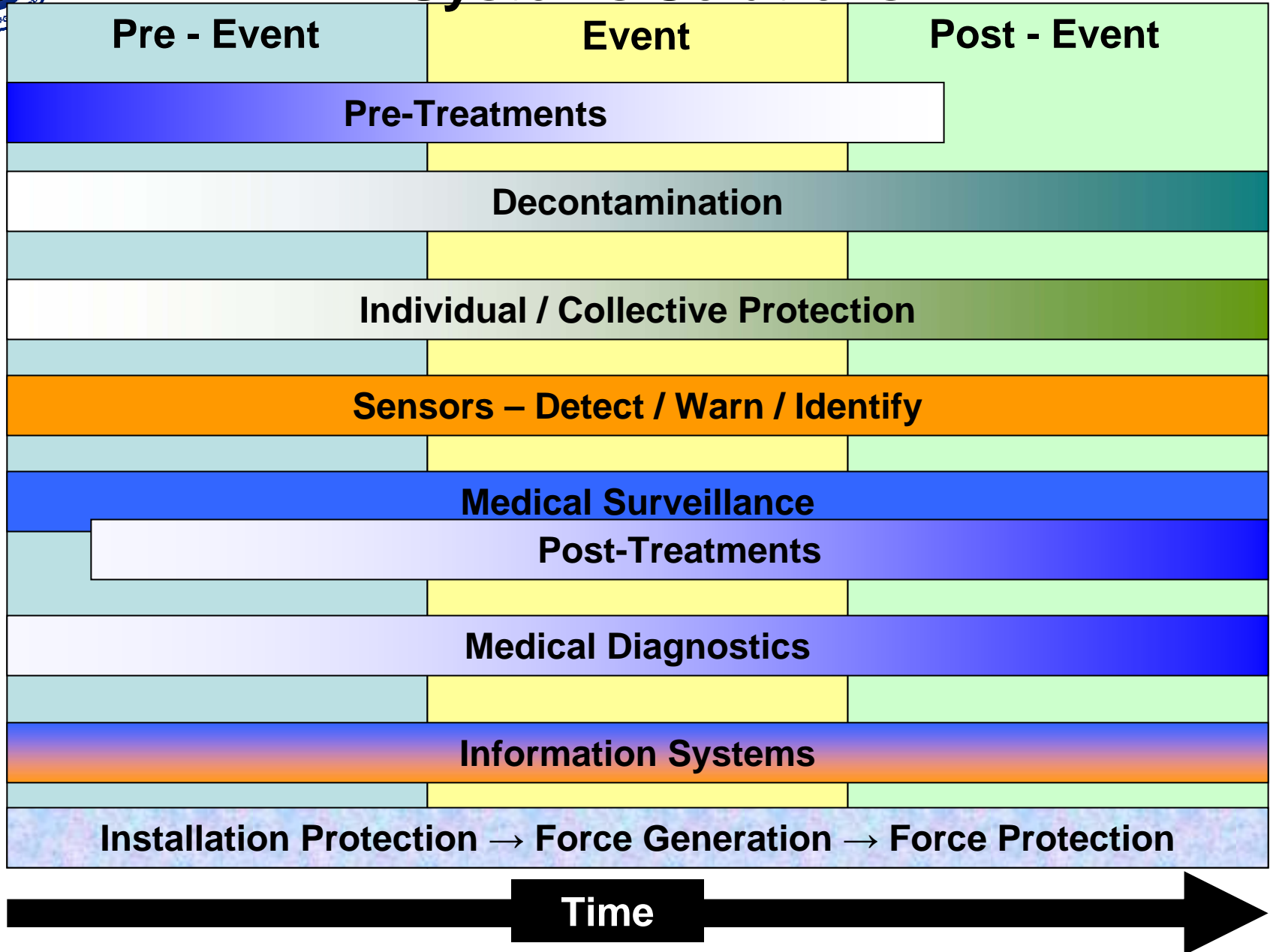


Where We Are Going



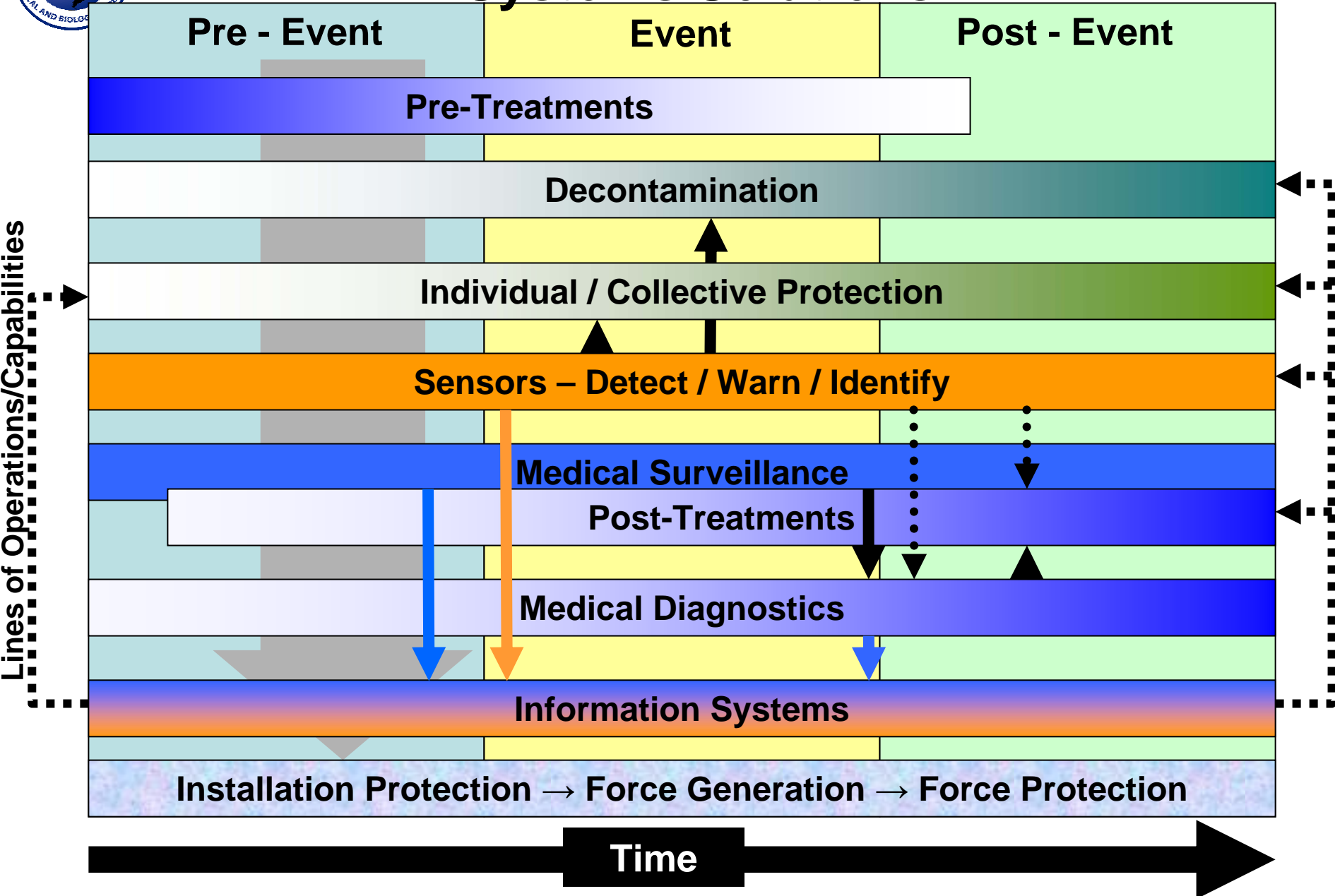
Systems Solutions

Lines of Operations/Capabilities



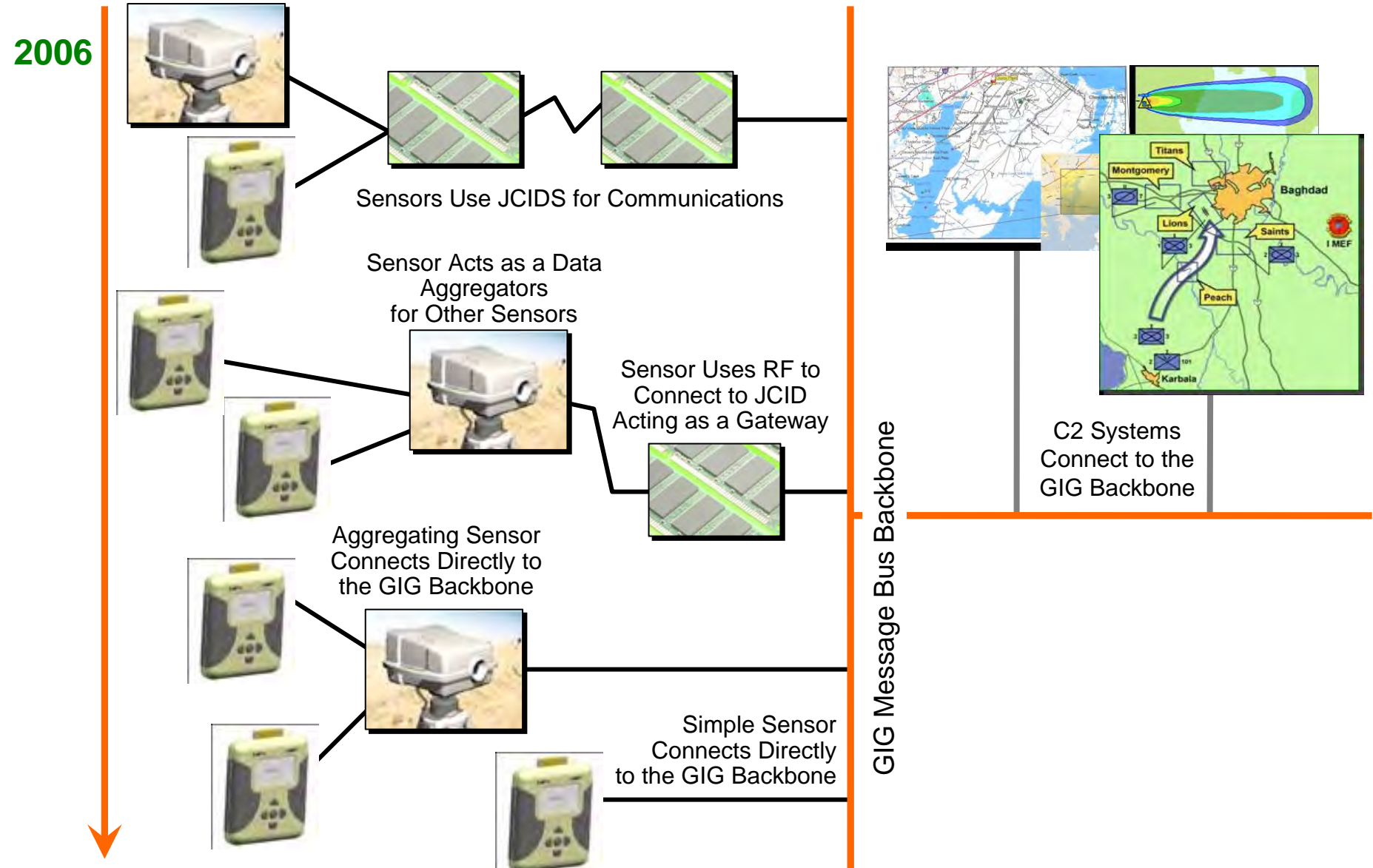


Systems Solutions



Migrating the Interface

Data Aggregation and Network Connectivity





Modularity Vision – A Plug & Play CB System



Two Key Parts:

- Multipurpose Interchangeable Detectors
- Common Interface and Communication System



Notional Modular
Chem Bio Interface Unit



Detector Component
In Removable
Cartridge

- Common Mechanical I/F
- Common Signal I/F
- Common Power I/F
- Common Comms Protocols



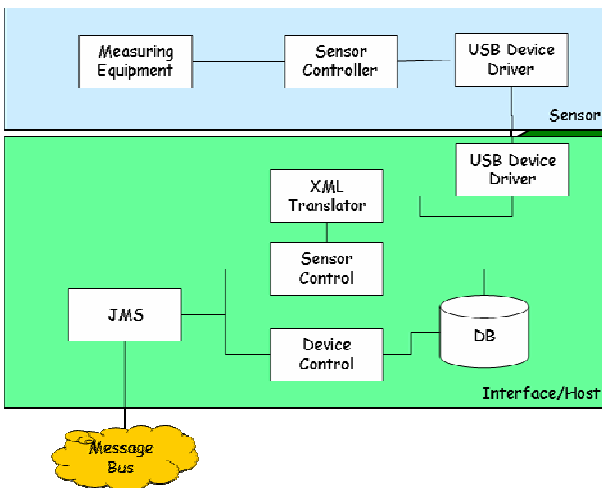


Sensor Architecture Evolution

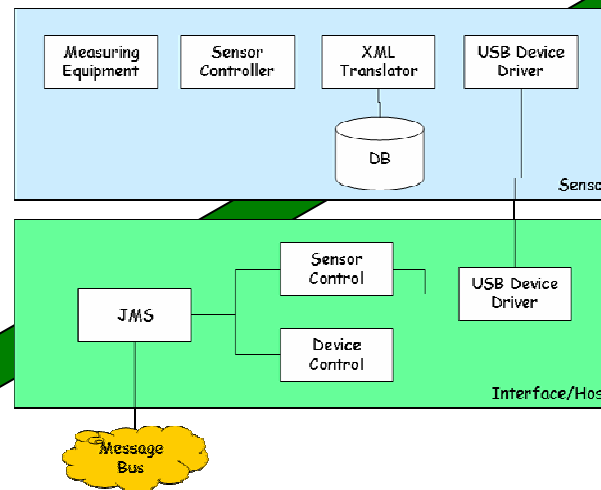
Enabling Technologies

- Serial Port Sensors
- Wired/ Wireless Ethernet
- Message Bus Infrastructure
- Open XML Messaging
- Power Over USB
- Power Over Ethernet

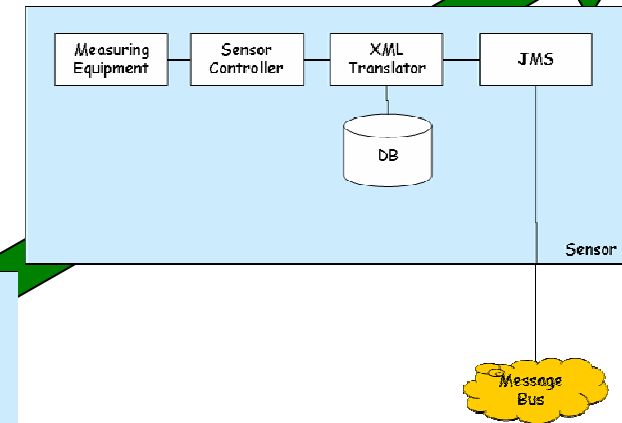
Near Term



Mid Term



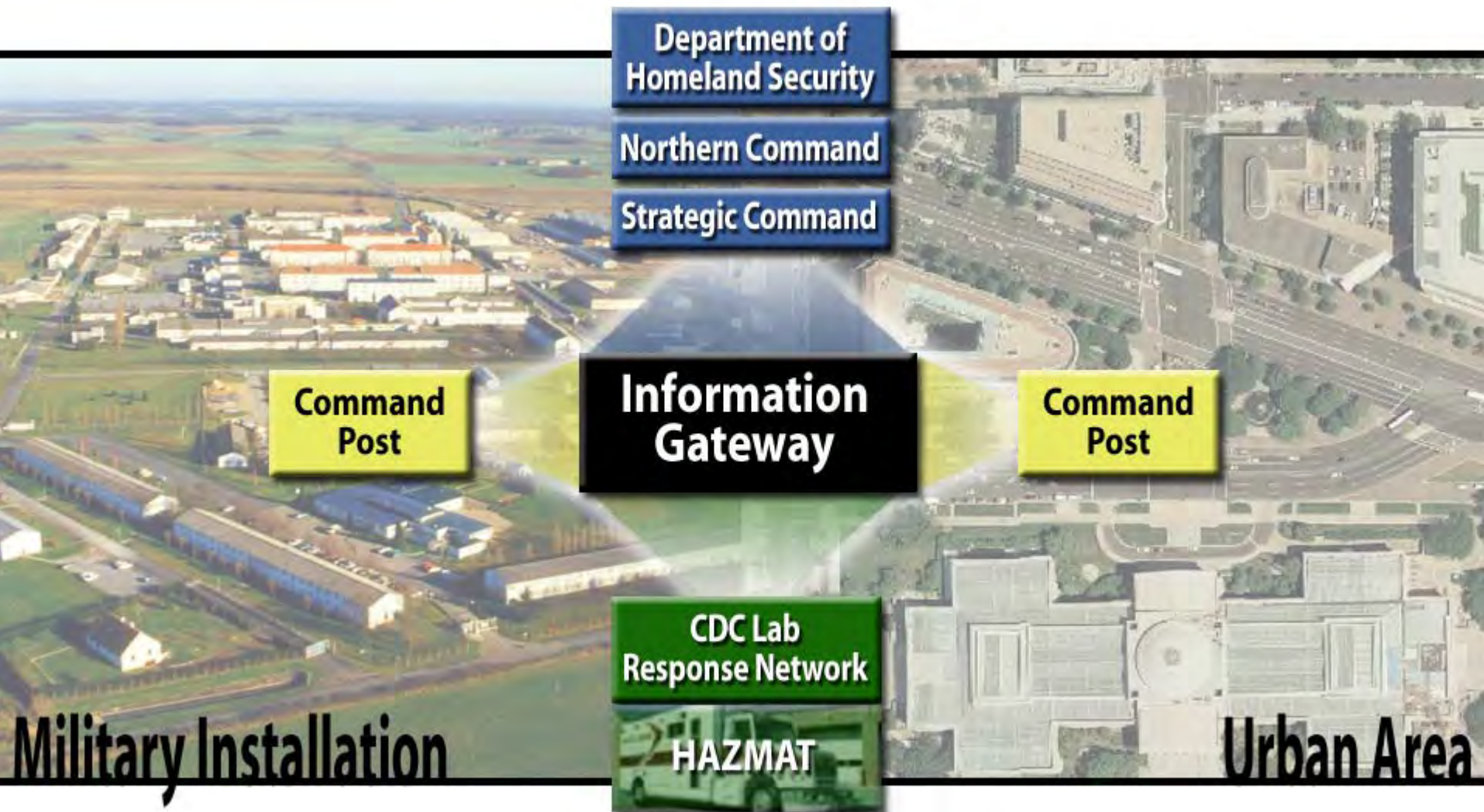
Far Term



Most Necessary Enabling Technologies are Commercially Available



Civil-Military Network Integration

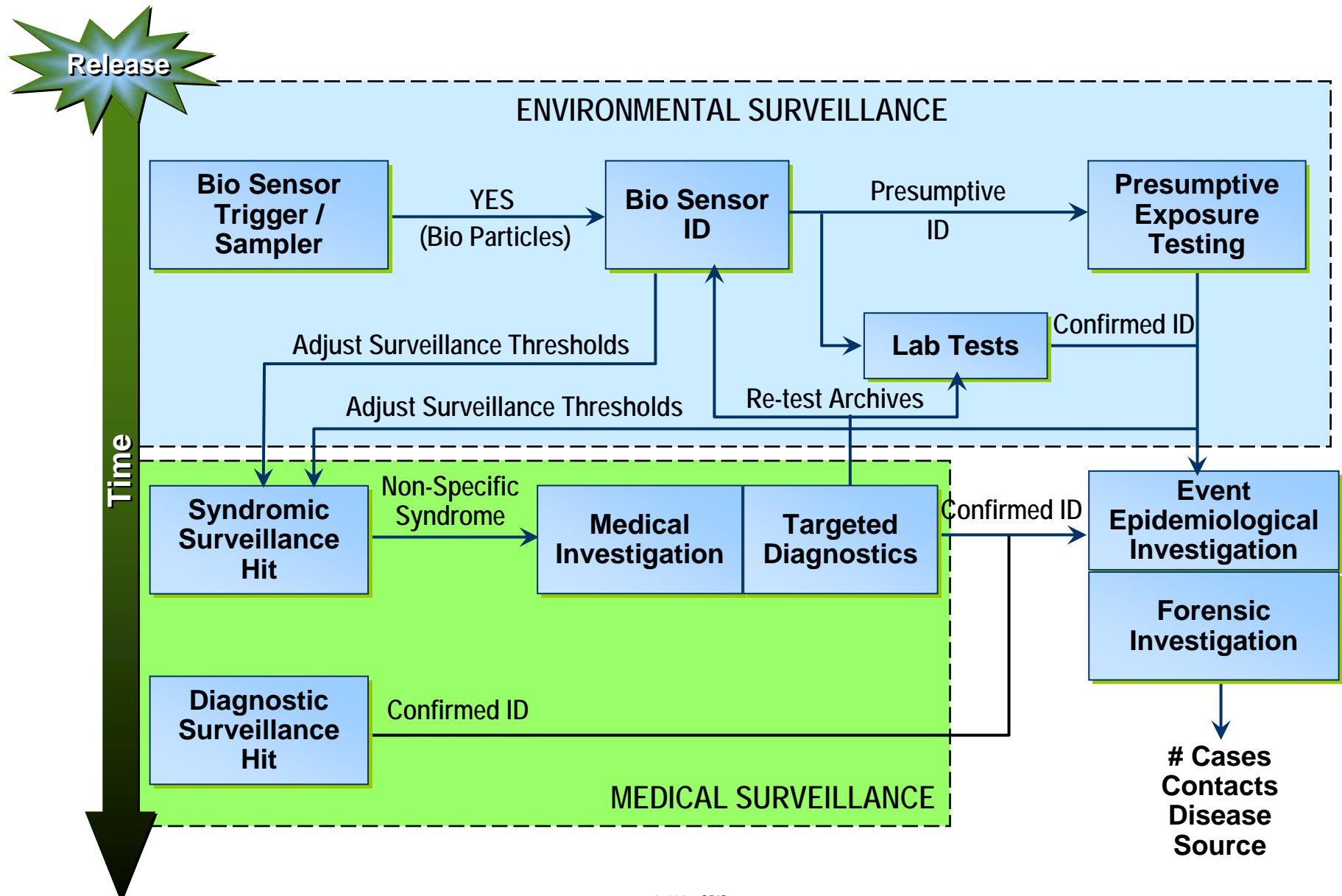




Responding to Bio Attacks

- **Organizing Principle is Spatio-Temporal**
- **Must Determine Where and When . . .**
 - **People/ Objects/ Facilities Exposed: Direct/ Secondary**
 - **People/ Objects/ Facilities Treated and Tested**
- **Speed is Critical Factor**
- **Data must be Geographically and Temporally Referenced**
 - **People/ Samples/ Objects**
- **Actions and Responses Vary Geographically**
 - **Proximity to Agent Source at Time of Release**
 - **Known Transmission Locations/ Paths (through agent transport or infected carriers); Spatio-Temporal Intersections**

Integrated Bio Surveillance Architecture





Integration of Multiple Disciplines

CONOPS

- Team Formation and Setup
- Sampling Protocols
- Standards and Metrics
- Coordination and Reporting

MODELS

Met/Dispersion
HVAC
People Movement
Agent/Disease Effects
Mission
Treatments
Meteorology

EEI TEAM

- Medical (CDC): Treatments/Examinations
- HVAC/ Meteorology Experts
- HAZMAT Responders
- Site/ Facility Manager: Facility info
- Mission Expert: Impact and Contact Information
- Environmental Experts
- Forensics Investigators

DATA INPUTS

Cases / Medical Records
Sensors
Casualties
Deaths
Treatments
Meteorology
Responder Locations

BACKGROUND DATA

Aerial Imagery
GIS Data
Critical Sites
Treatment Centers
Supply Centers
Transit Stations

Rapid
Spatio-Temporal
Common Picture

INVESTIGATION TASKS

Interviews
Sample/Test: Location, Person, Clothing, Effects
Cordon/ Quarantine
Coordinate Treatments/
Transport/ Decon
Coordinate Resources
Collect Forensics

Automated Event Epidemiological
Investigation Decision Support Tool



Developing Joint Warfighting Capabilities





Where We're Going

- **Start with Net Centricity In Mind**
- **Start with Accredited Information Assurance Solutions**
- **Common Infrastructure for CBRN Sensors**
 - Bus/ Services Architecture
 - CBRN Modules

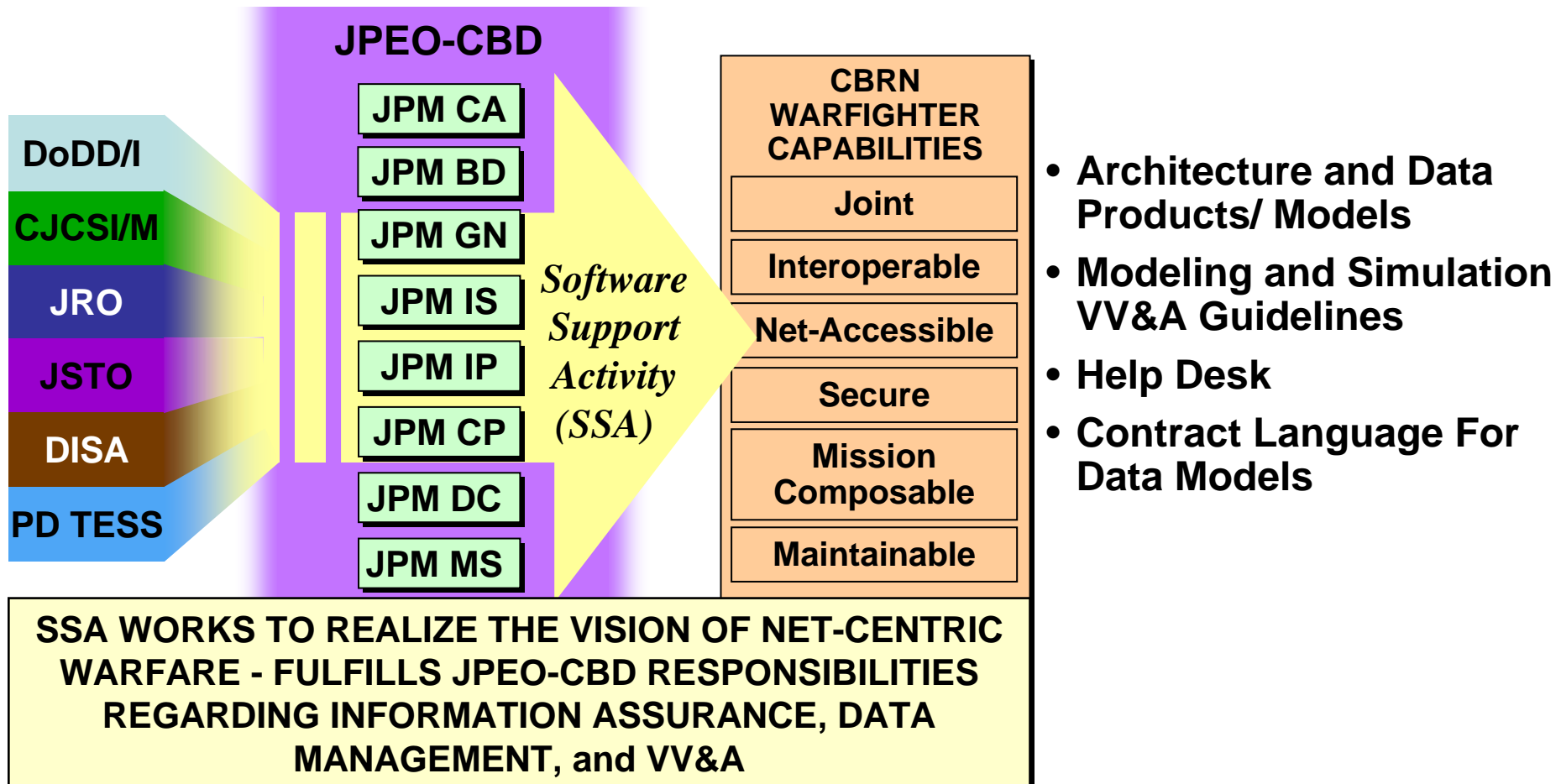
“Systems” From Modules



Making It Happen Software Support Activity

Born August 2004

CBRN-SSA VISION





Collectively How We Make It Work!

- **Common, Open Standards and Architectures**
- **Accredited, Verified and Validated Software**
- **Technology Transition Agreements Between S&T and Advanced Development**
- **Lifecycle Modeling and Simulation Strategies**
- **Information Assurance In All Activities**



What Information Systems Must Do

- **Work Within**
 - **External Systems Applications to Higher Levels of Integration**
 - **Integrated Systems Vice Platforms**
 - **Systems of Systems**
 - **Families of Systems**



Challenge: Make It Work!

- **Co-Evolution in Organization and Processes**
 - Services
 - Combatant Commands
 - Civil-Military Integration
- **Expanding Mission Space Relevant to U.S. National Security**

Services Undergoing Dramatic Changes



Questions/ Discussion

Colonel: This is the most fantastic story I've ever heard!

Pilot: And every word of it's true, too.

Colonel: That's the fantastic part of it!

-- *Plan 9 From Outer Space*,
1959



The Reason for Our Success...



... Our People



Joint Program Executive Office





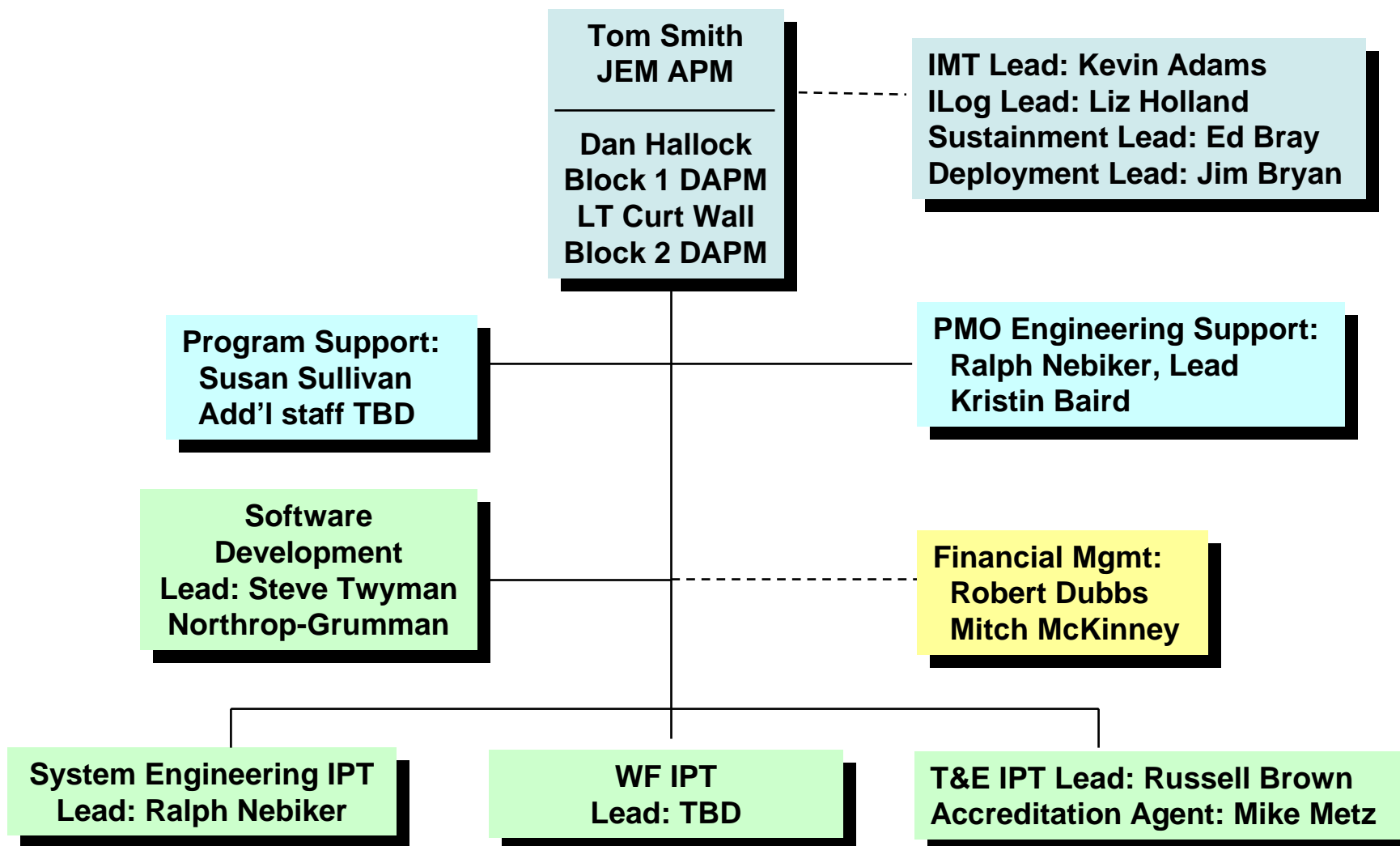
Joint Effects Model (JEM) Briefing to CBIS

25 October 2005

Tom Smith
JEM APM
858-243-1475
thomas.r.smith@jpmis.mil



JEM Program Office Org Chart





Description

- **JEM is an ACAT III Program that will provide a single, validated capability to predict the transport and dispersion of Chemical, Biological, Radiological and Nuclear/Toxic Industrial Hazard events and their effects**
- **JEM will be accredited for all uses currently supported by the three interim accredited DoD S&T Hazard Prediction Models**
- **JEM will be integrated with service Command & Control Systems and will also be available as Standalone**

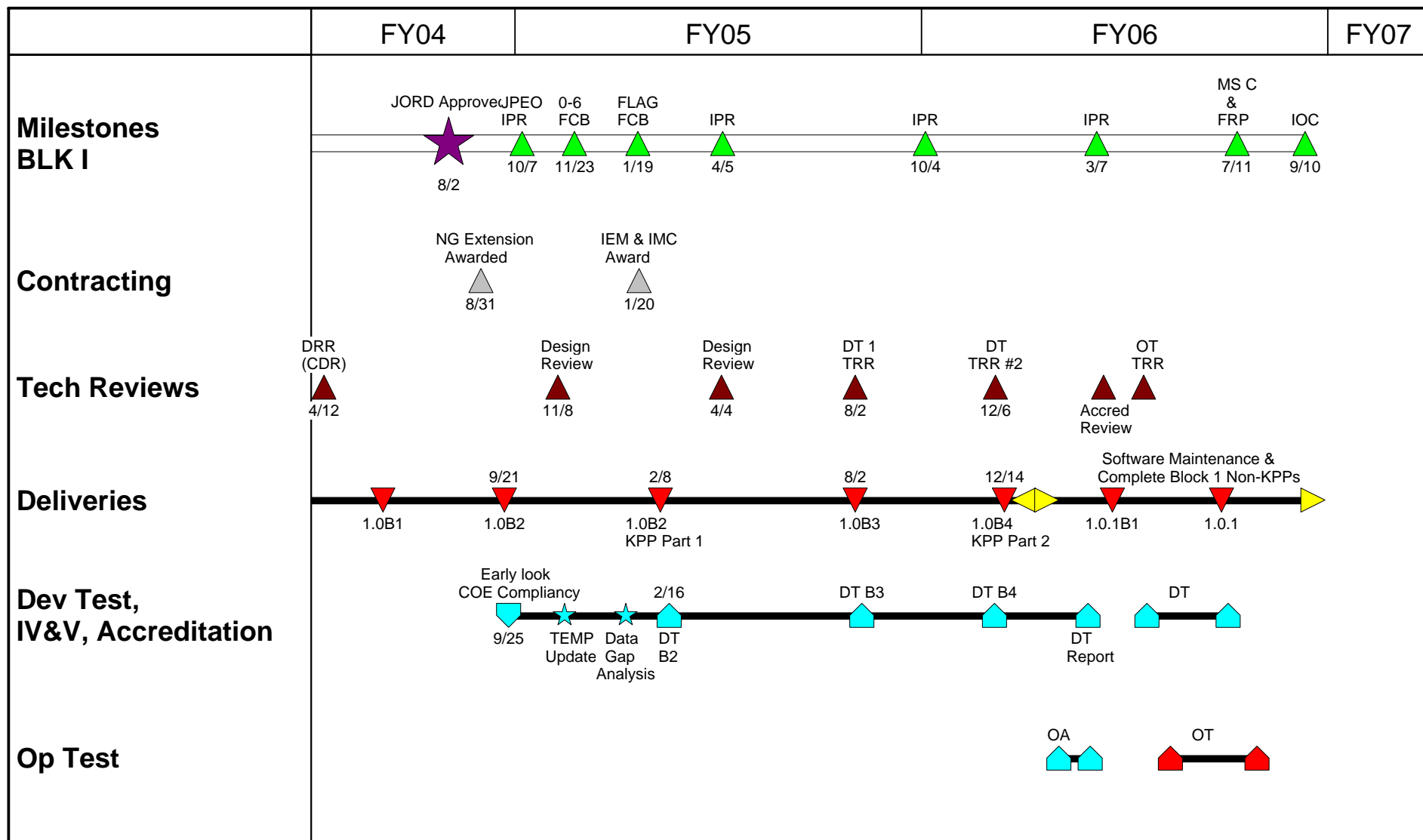


Core Capabilities

- **Transitions HPAC, VLSTRACK, and D2PUFF technologies and baselines the DoD hazard prediction capability**
- **Supports multiple deployment strategies**
 - Operates on both UNIX and Windows operating systems
 - Common Operational Environment (COE) / Network Centric Enterprise Services (NCES) / GIG / Service C2 systems
 - Standalone, Networked, Distributed, or Web access
- **Provides high fidelity hazard predictions to:**
 - Joint Warning and Reporting Network (JWARN)
 - Joint Operational Effects Federation (JOEF)
 - Any authorized system calling the JEM Web Services Interface
- **Interoperates with meteorological data systems**
 - Virtual Natural Environment Net Centric Services (VNE-NCS), METOC Data Service (MDS), Integrated Meteorological System (IMETS), Joint Weather Impact System (JWIS), and others

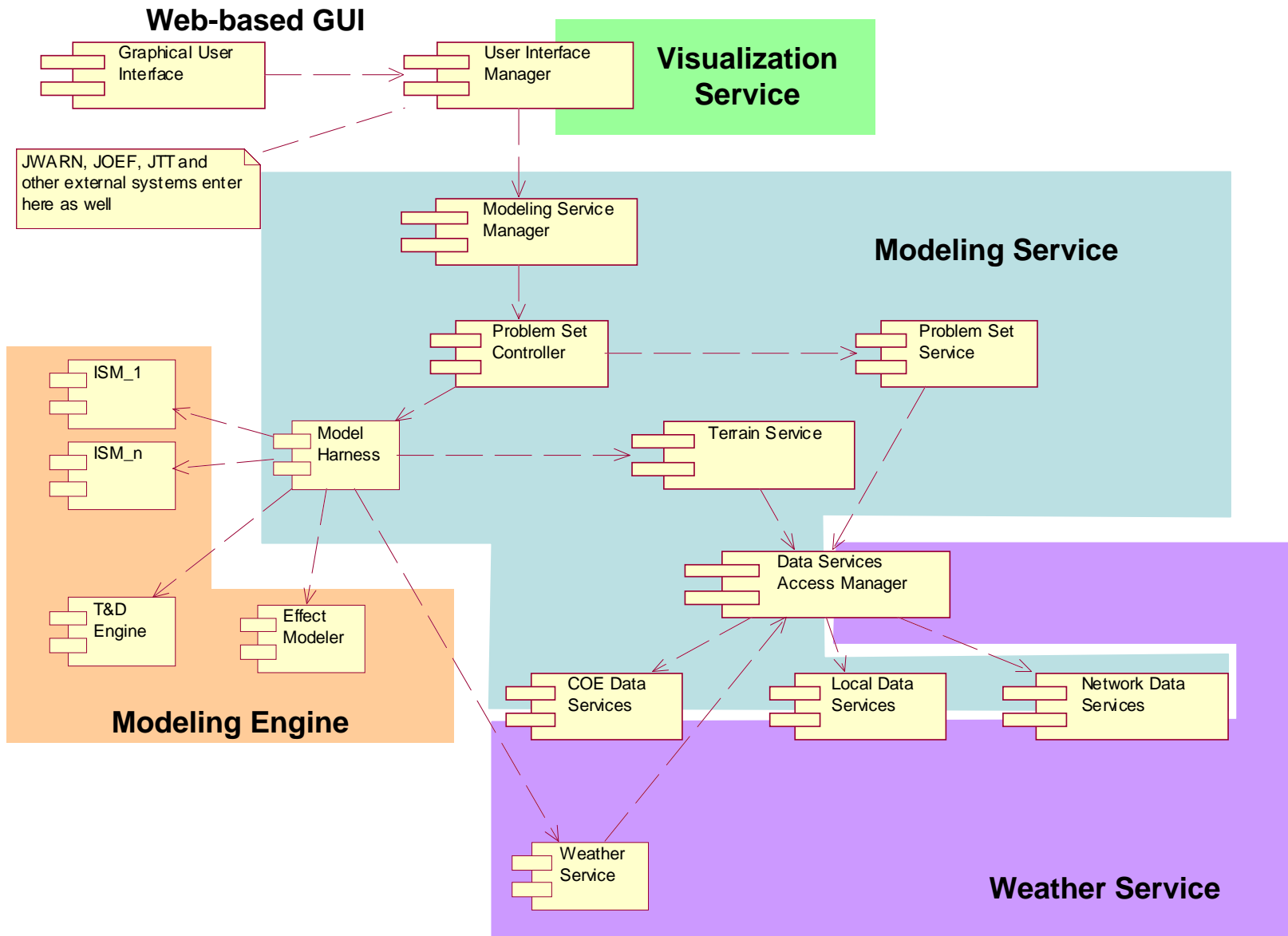


JEM Block 1 Schedule





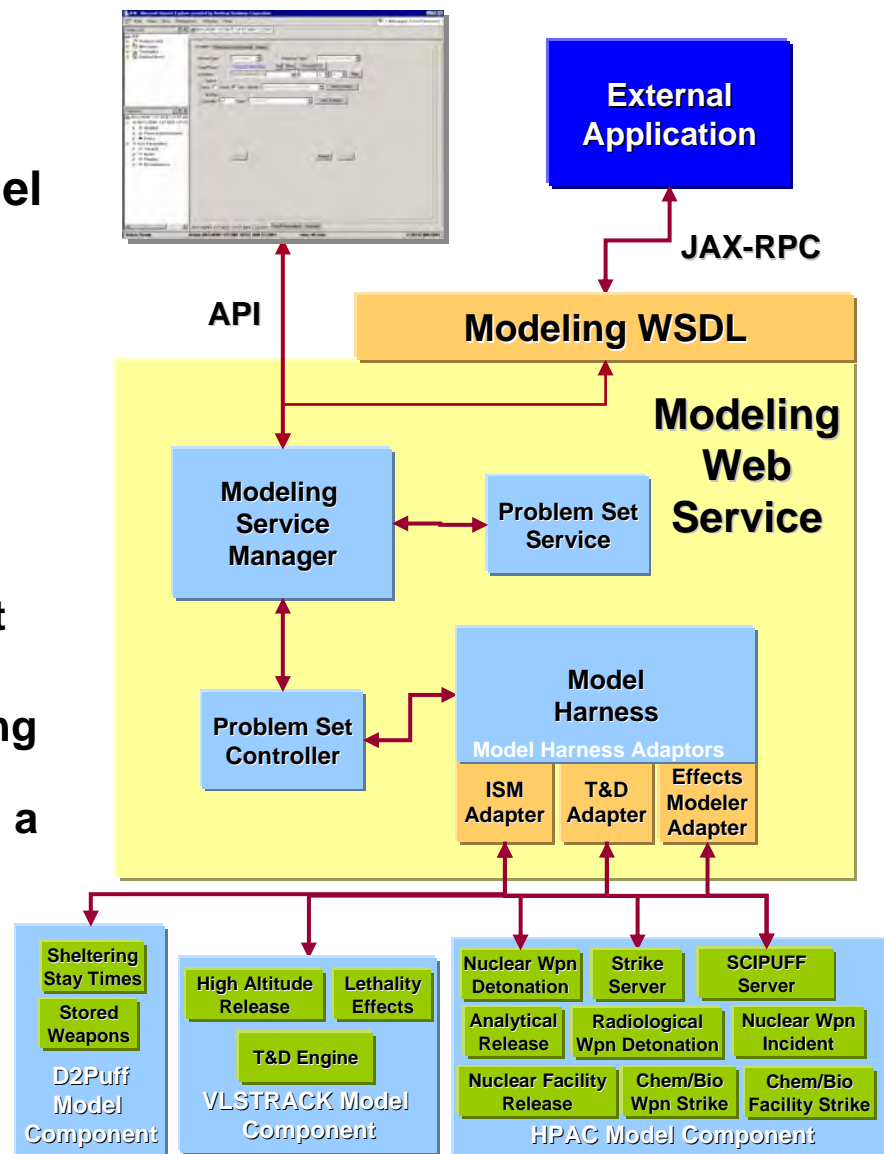
Component Level Diagram



Modeling Capability Overview

Modeling Interfaces

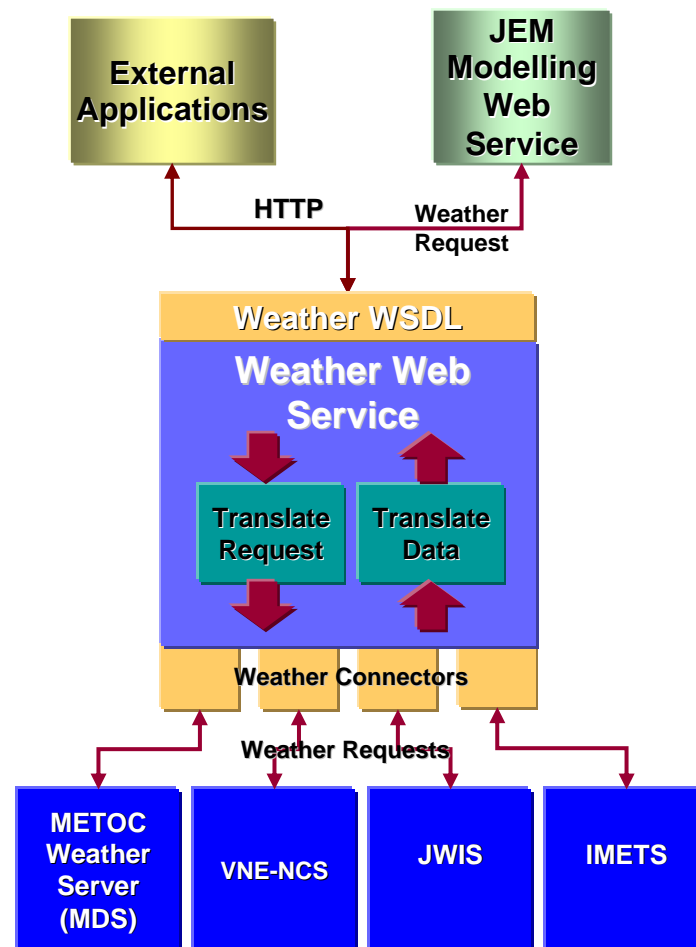
- Defined by the Modeling WSDL
- WSDL will use the CBRN Data Model terminology
- W3C standard's SOAP communication over HTTP
- Allows external applications to
 - Receive a list of Problem Set Templates
 - Run a Problem Set Template against their inputs
 - Define and run a single incident using defined terrain type and fixed wind data or download weather data from a specified weather server
 - Suspend, resume, terminate a run
 - Retrieve a file listing the inputs and the resulting plot data
 - Default run parameters values are used





Weather Service Overview

- Provides METOC data for JEM, JWARN and JOEF
- W3C standard SOAP communication over HTTPS
- Aligns with CBRN Data Model
- Connects to Weather Servers through Connectors
 - MDS
 - Virtual Natural Environment Net Centric Services (VNE-NCS)
 - JWIS
 - IMETS
- Expandable – can readily add new Weather Connectors
- Supports caching weather files in the file system





JEM Results Tab

Joint Effects Model - Mozilla

File Edit View Modeling Debug Help

JEM

- Problem Sets
 - TED_1
 - Incident 1
 - Physical Environment
 - Run Parameters
 - Results
 - Notes
 - TED_2
- Templates
 - CL-2 facility strike
- Batch
 - Queued
 - Running
 - Completed

TED_1

Incident 1 Physical Environment Run Parameters Results Notes

Run List

- Run 1
- Run 2
- Run 3
- Run 4
- Run 5
- Run 6
- Run 7

Assumptions

Detail Print

RESULTS OF RUN PERFORMED AT Wed Apr 06 14:48:55

PDT 2005

Plot type: Default

Choice index: 0

Kind index: -1

Category index: -1

Type index: -1

Time index: -1

Output filename: 1112824135734

Output file type: ARC and SHP

Legend

29-Apr-03 03:00:00Z

Sarin Casualties (Default Plot)

10%

90%

50%

Custom Options Help

Clear First: ☒ Map

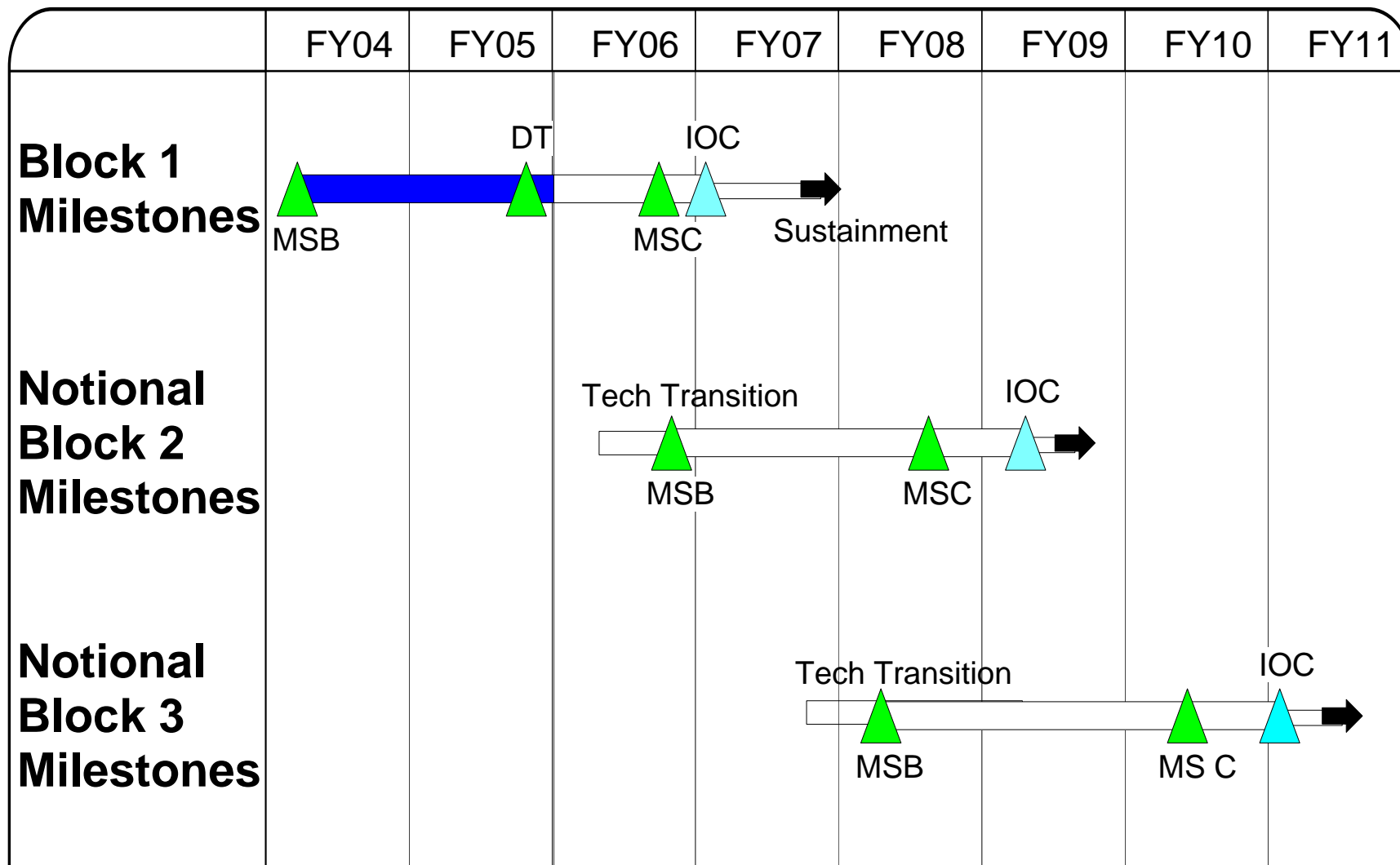
Preview

Ready

jemteam jemcustomer2 2005-04-25 14:56:10Z



Notional 3 Block Schedule

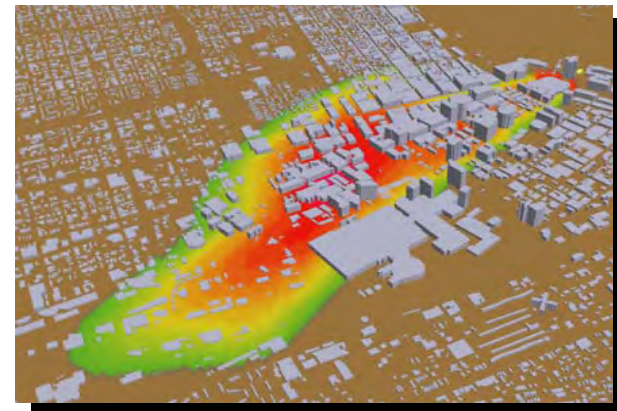




JEM Block II

- **Technologies for Block II:**

- Urban Modeling
- Littoral/Coastal Effects Modeling
- Missile Intercept Hazard Prediction
- 10% Improvement in Speed & Accuracy of JEM Baseline
- Source Term Estimation (Backtracking)
 - Includes incorporating sensor data
 - Estimate source term
 - Refine hazard prediction
- Calculate initial & delayed casualties and incapacitation for both civilian and military populations
- Estimate effects from a 5,000 weapon strike in less than 90 minutes
- Allow user to modify input parameters to accommodate population migrations





JEM Block II Strategy

- **Request For Information (RFI) Issued 2004**
 - **Final report (Aug 2004) assessed technology based on:**
 - Documentation
 - Interviews with developers, not users
 - **Priority given to VV&A History**
 - **Technology readiness levels / Assessments dated**
 - **Areas addressed/solicited:**
 - Urban Hazard Effects Prediction Modeling Capability
 - Improved Transport and Diffusion (T&D) Methodology
 - Intercepted Missile Hazard Effects Prediction Capability
 - Coastal and Littoral Areas Capability
 - Improved Population Impact Capability
 - Source Term Location Estimation Capability
 - Strike File Capability



Block II Strategy – Way Forward

- **Request For Information (RFI)**
 - Reconvene Independent Model Analysis Team
 - Refresh report on technology/reassess TRLs
 - Support Analysis of Alternatives (AoA) – JCIDS
 - Determine if technology fits in Block II or III
 - Support generation of CDD (ORD)
 - Lever results and analysis in BAA selection process
- **Planning on 2 contracts**
 - Request For Proposal (RFP) for Integrator
 - Integrate all technologies/models into one baseline
 - Broad Area Announcement (BAA) for models/technologies
 - Multiple contracts issued to specific capabilities



Block 3 Requirements

- **Block 3:**
 - **Waterborne Hazards**
 - **Complex structures, Building interiors**
 - **Human performance degradation**
 - **Contagious/infectious diseases**
 - **Effects on aircraft at various altitudes/ships underway**

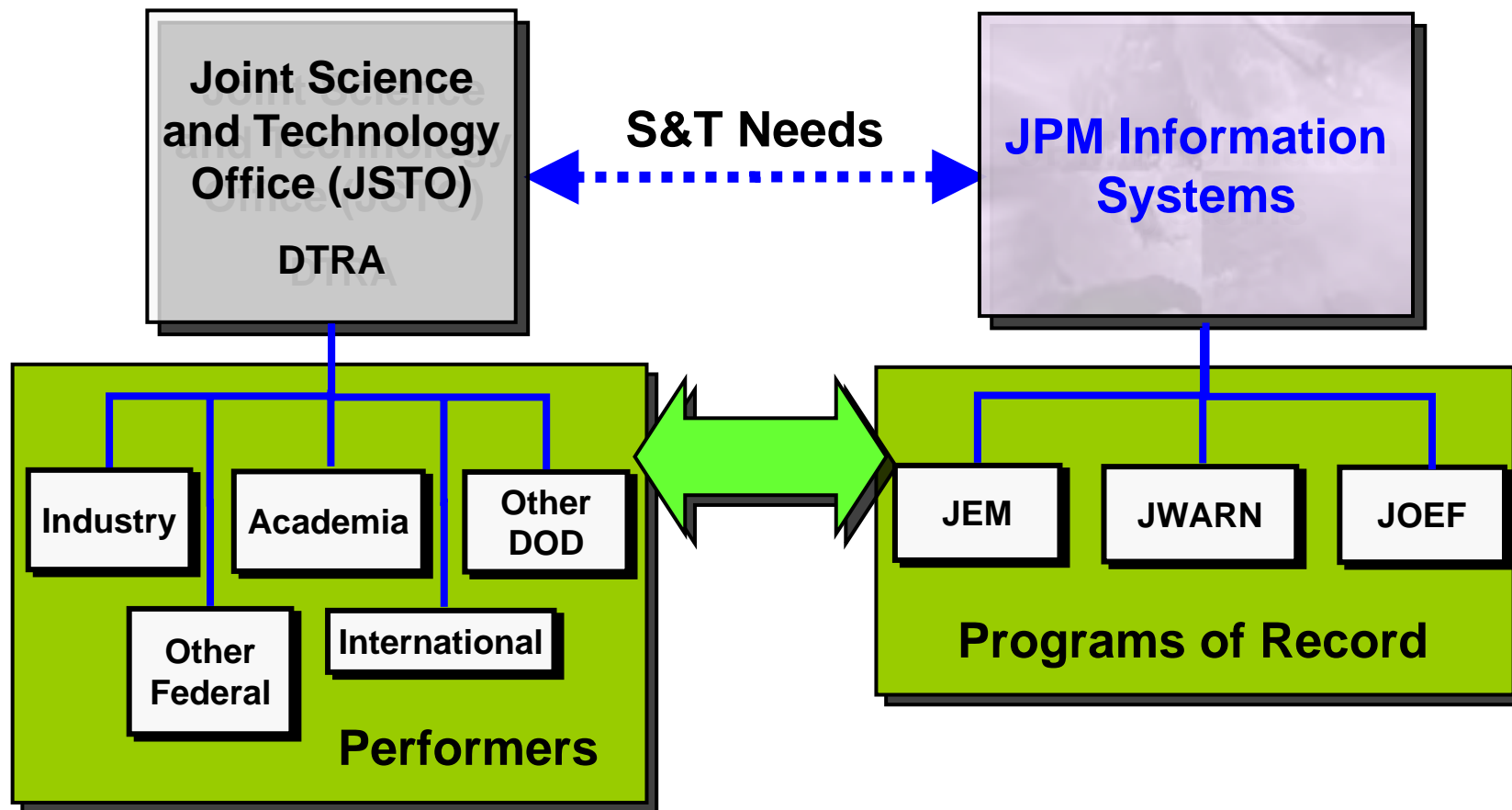


JEM Technology Challenges

- **Performance of Service Oriented Architecture (SOA) applications on CPU & memory constrained systems**
- **Incorporating urban hazard modeling and other advanced modeling into SOA**
- **Satisfying diverse weather requirements**
 - Data intensive
 - In-and-out of COMMS issues
 - Service specific data needs
- **Maturity of advanced modeling capability**
 - Nature of S&T development programs
 - Reliable data for supporting model technologies



Science & Technology (S&T) Transition

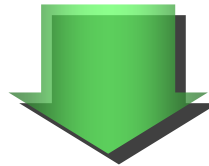


JPM IS coordinates with the JSTO for S&T needs

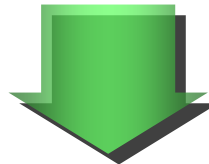


S&T Transition Example

- **Agent Fate S&T Program**
 - Addressing Secondary Evaporation of CB Agents
 - Produces more accurate data



- **JSTO & JPM IS agree on data custodianship**
- **Transition data to JPM IS via technology transfer agreement (TTA)**



- **JEM will incorporate new Secondary Evaporation data**
 - Improves model accuracy



JEM Status

- **Working closely with JSTO on Block 2 & 3 technologies**
- **Participating in International Task Force 49 (ITF-49) to increase interoperability between Canada, UK, and US**
- **On track for successful Block 1 Milestone C in Fall 2006**
- **Making preparations for Block 2 Milestone B in FY2006**



Questions?



JWARN



Joint Warning and Reporting Network™

Overview

Mr. Chuck Walker
JWARN Acquisition Program Manager
Joint Project Manager Information Systems
(858) 537-0215
chuck.walker@jpmis.mil



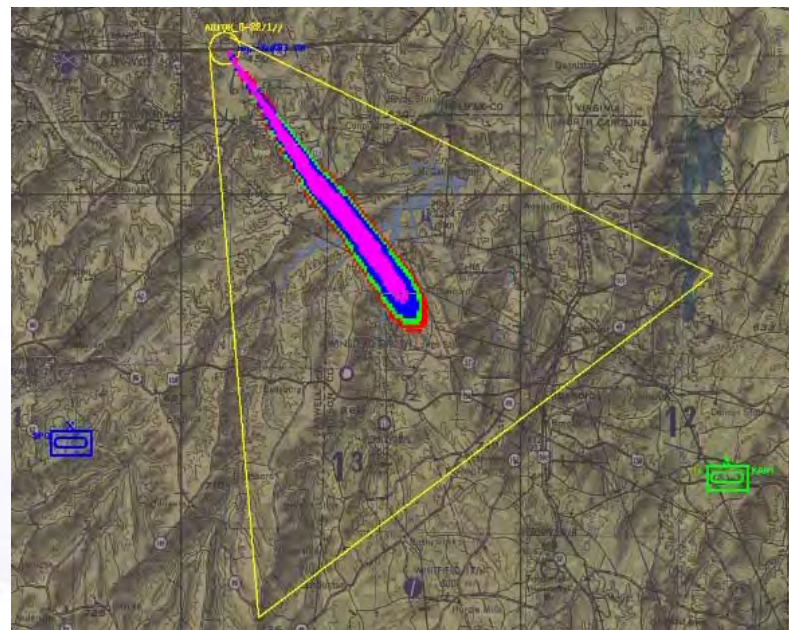
JWARN Description

- **Connects CBRN sensors directly to Joint and Service Command and Control (C2) systems**
- **Consists of software segments operating on the C2 systems**
- **Provides the means to configure, monitor and manage the sensor network**
- **Automatically, in near real-time, provides the following:**
 - Alerts from the sensor network
 - Plot of the hazard area
 - Displays plot on the Common Operational Picture (COP)
 - NBC warning and dewarning message to units in the hazard area



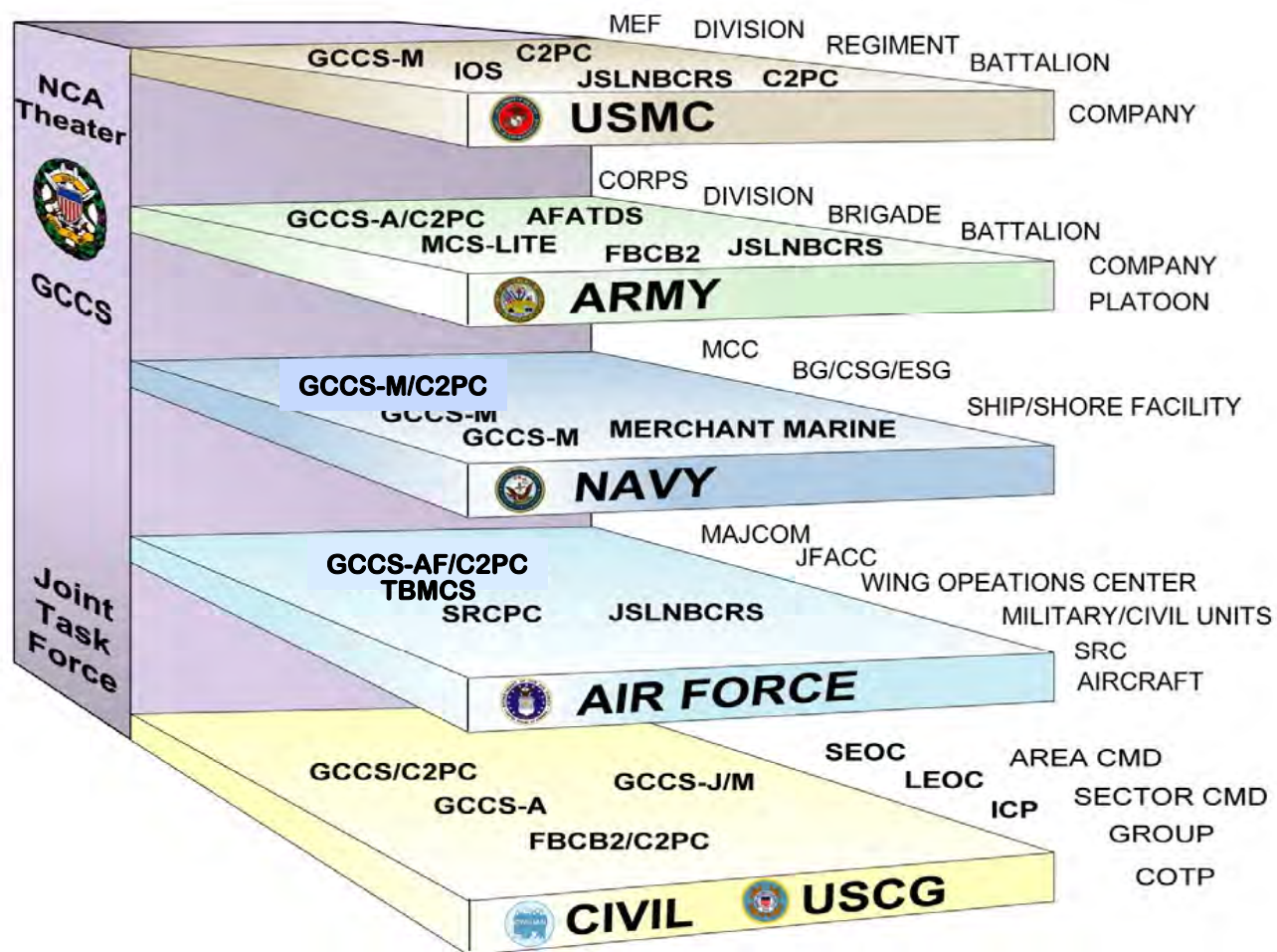
JWARN Core Capabilities

- **Enables an immediate and integrated response to threats of contamination through rapid warning and dissemination of CBRN information:**
 - Automatically collect and consolidate sensor information
 - Transport sensor-derived information through the JWARN Component Interface Device (JCID) network to the host C2 platform
 - Report CBRN and Toxic Industrial Materials (TIM) hazard detection
 - Generate hazard area plot MTP-45 and Joint Effects Model (JEM)
 - Display hazard warning area on Common Operational Picture (COP)
 - Generate warning and de-warning (NBC) messages to affected forces

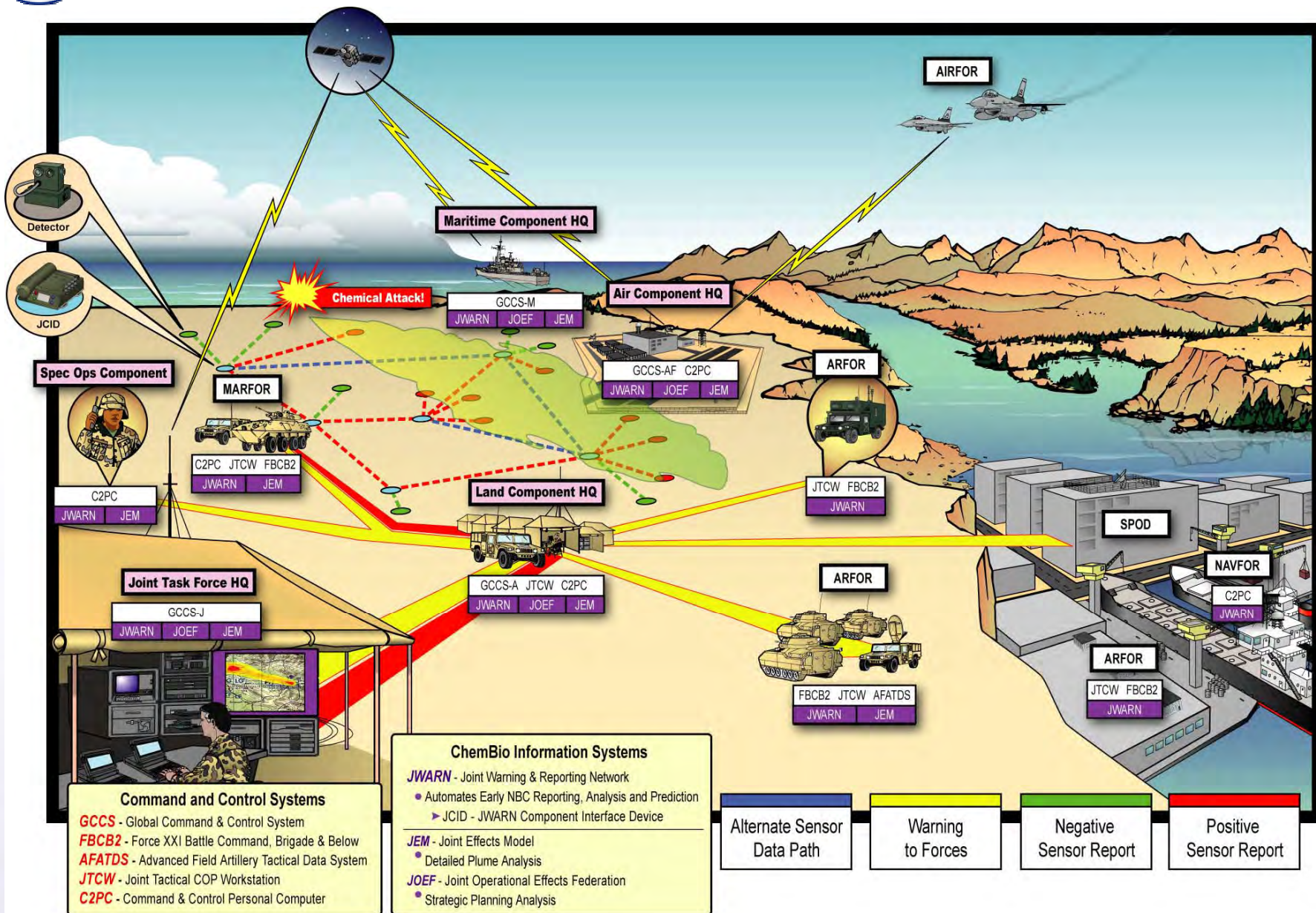




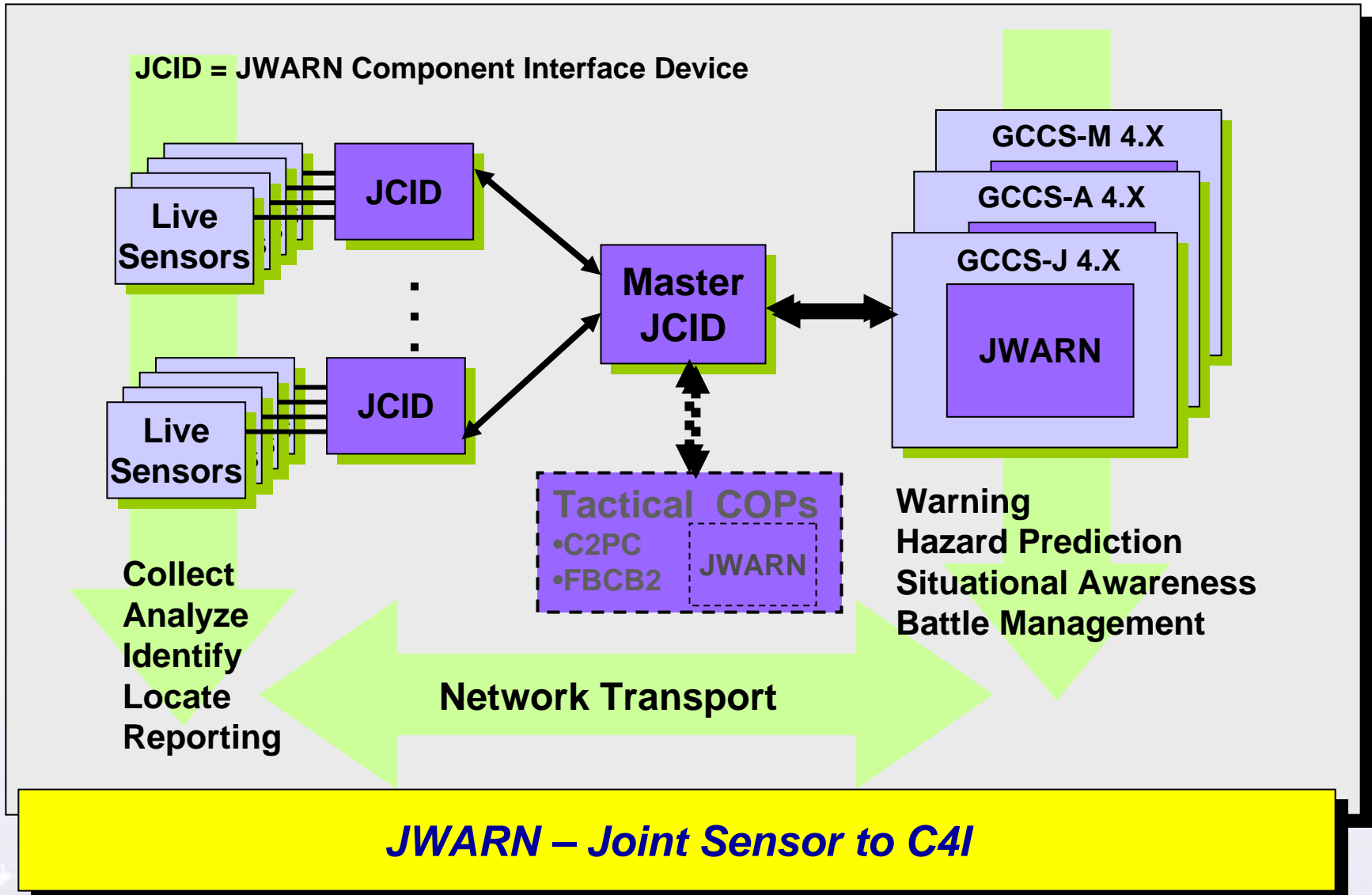
JWARN Reaches Across All Echelons



JWARN Operational View

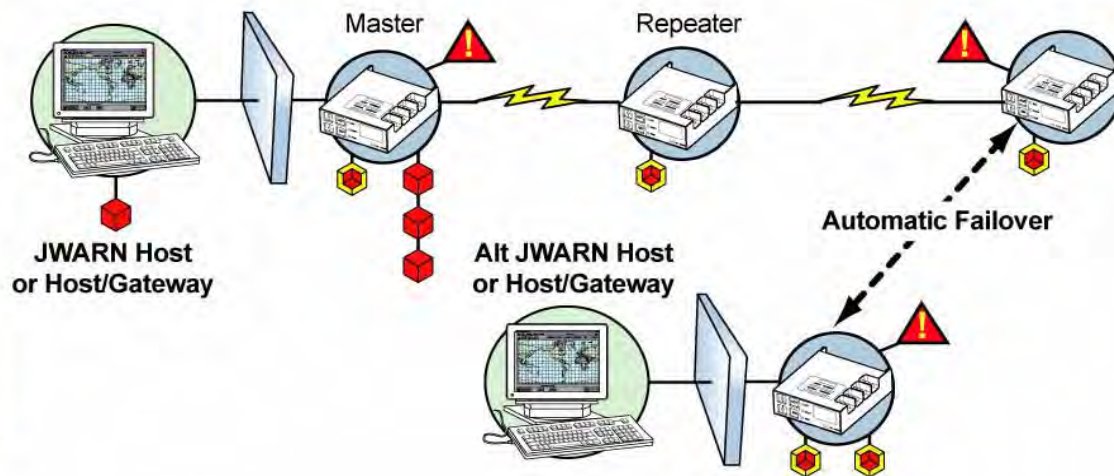
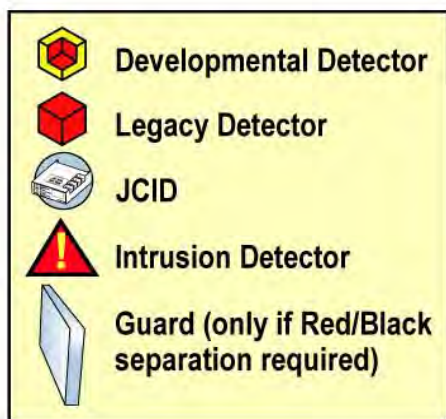
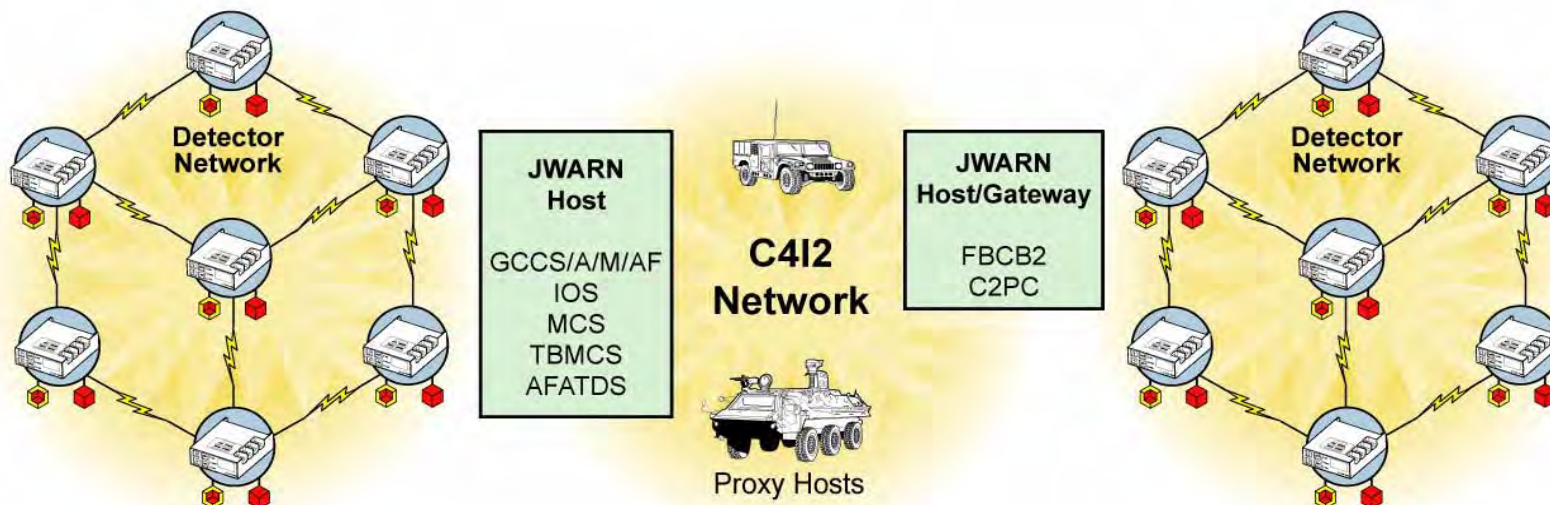


JWARN System View





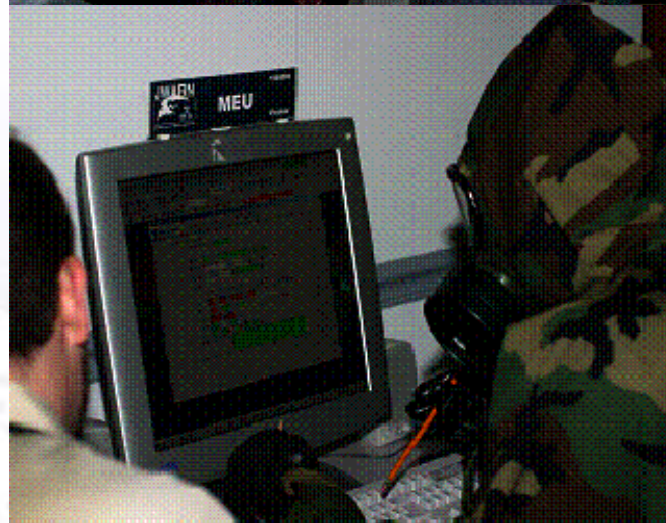
JWARN Detectors on Host and JCID Networks





Benefits to the Warfighter

- Automates a process which was previously manual and error prone
- Minimizes time from detection to warning (less than 2 minutes)
- Provides timely warning and de-warning of affected units to maximize combat effectiveness
- Automates recording and archiving of exposure data which will enable more effective forensic analysis
- Compatible and integrated with current and future Command & Control systems





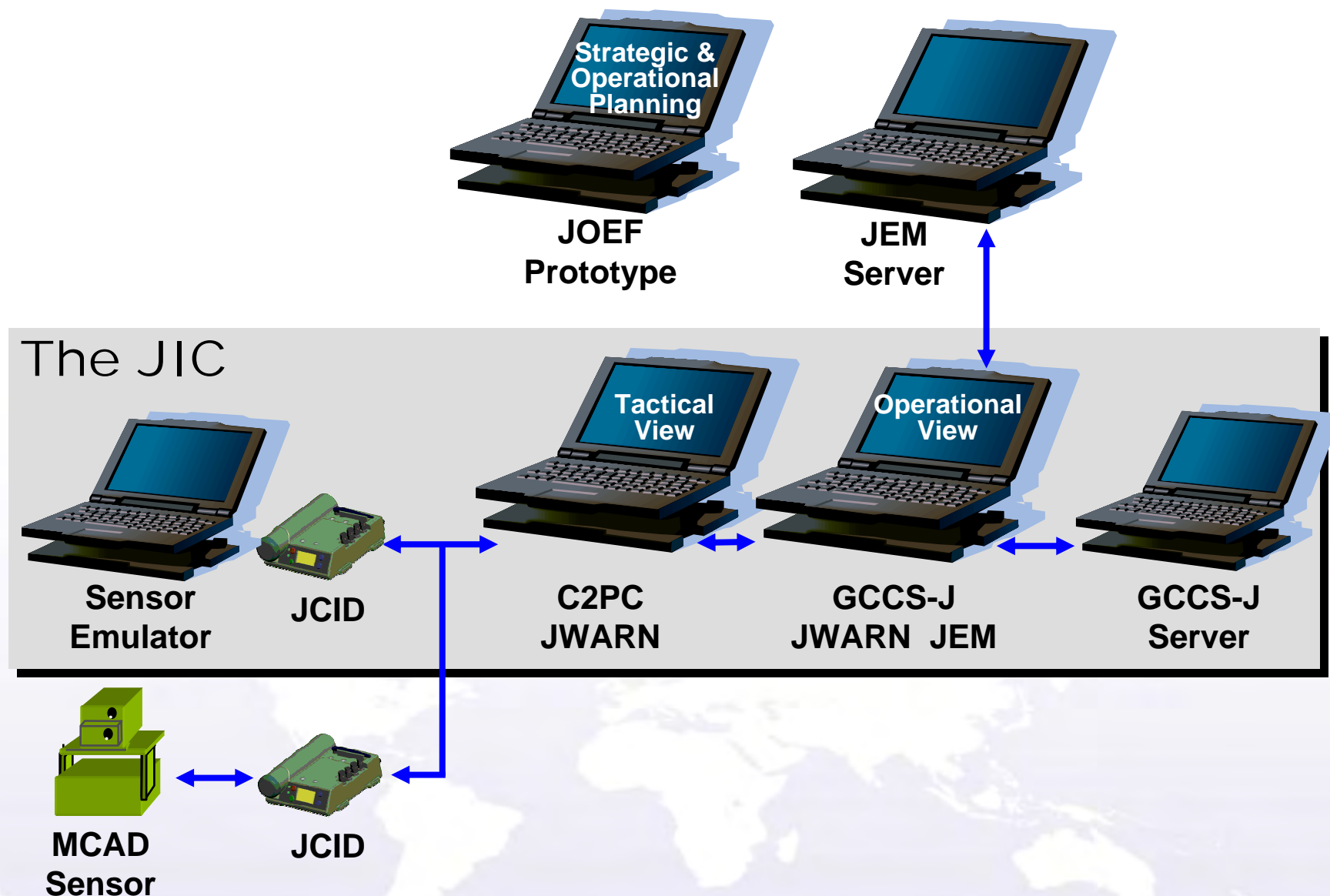
JWARN Initial Capability (JIC) Prototype

- Support early Warfighter involvement with JWARN, Joint Effects Model (JEM), and Joint Operational Effects Federation (JOEF) technologies
- Support of User Interface requirements
- Provide an opportunity to validate and refine the Services' CONOPS and Tactics, Techniques, and Procedures (TTPs)
- Support User Assessments (UA)
- Support Conferences, Technical Demonstrations (CWID2005) and Experiments
- Support early Integration and Data Management for an integrated System
- Provide a venue to validate and refine Measures of Performance (MOPs) and Measures of Effectiveness (MOEs)
- JIC suites are available at no cost to qualified organizations

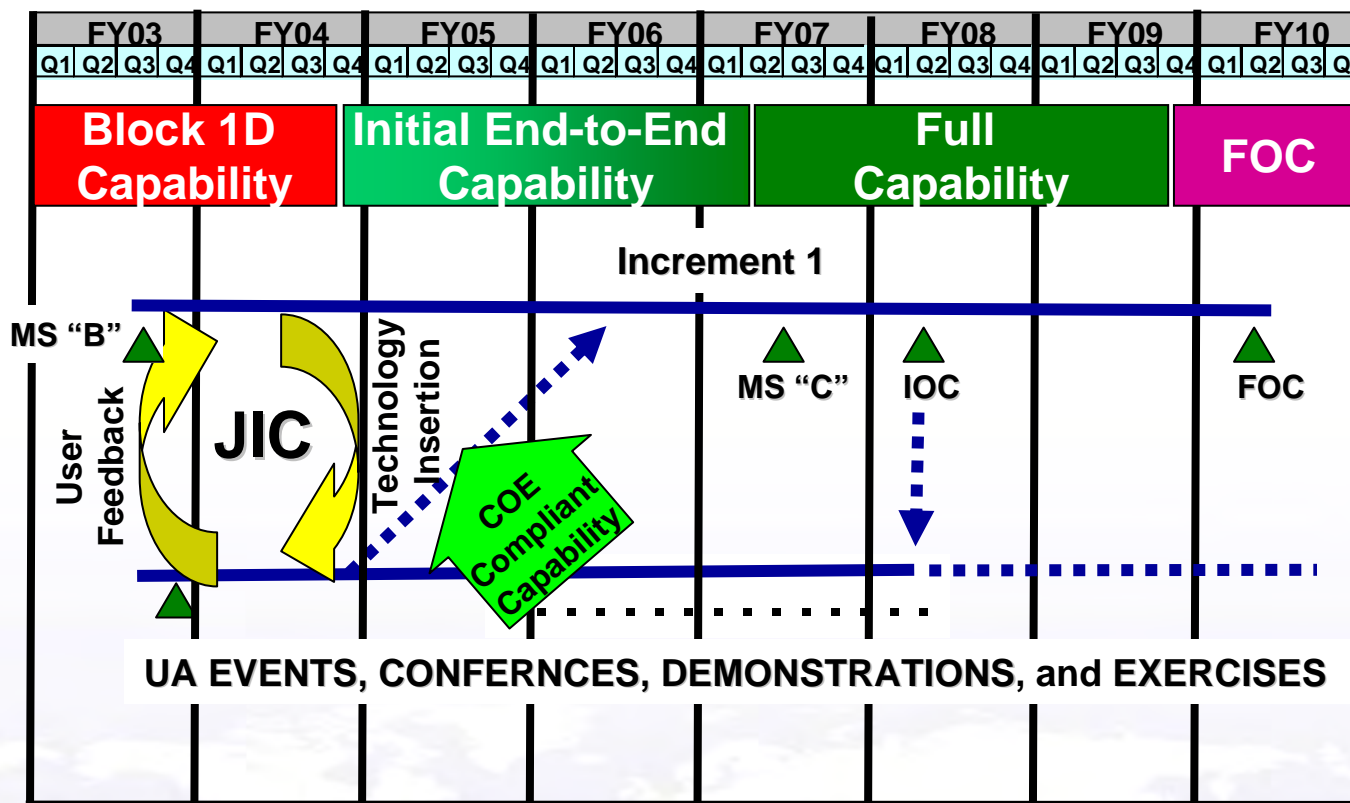
JIC will be used to generate operationally “relevant” feedback from the Warfighter to the Developer



JIC Architecture



Science & Technology (S&T) Insertion and JPM-IS Initial Capability (JIC)



JIC generates operationally relevant feedback from Warfighter to Developer
JIC is a platform for Science and Technology (S&T) insertion into a Program of Record



CWID '05 Concept Demonstration

- **What the trial demonstrated:**
 - Rapid, sharing of CBRN information across Civilian and Military Command and Control (C2) domains
 - A viable, Cross Domain Solution (CDS)
 - Civilian → Military (ASOCC)
 - Military → Civilian (WebServer)
- **The trial components:**
 - 1 Civilian and 4 Military systems, in 3 Locations, all connected & interoperable
 - Teaming Partners: JWARN, JEM, IIMS, ASOCC, and JPS
 - Trial Partners: DMIS, Wireless Wall, and Tidewater Technologies
- **What each site demonstrates:**
 - DAHLGREN – End-to-end: 1st Responder provides input & receives output, all 3 sites involved
 - NORTHCOM – End-to-end: Military input & warns Civilians and Military, all 3 sites involved
 - SPAWAR – End-to-end using dissimilar systems: Military IIMS & warns Civilian & Military, all 3 sites involved

SPAWAR

National Guard Bureau West

NORTHCOM

National Guard Bureau HQ

DAHLGREN

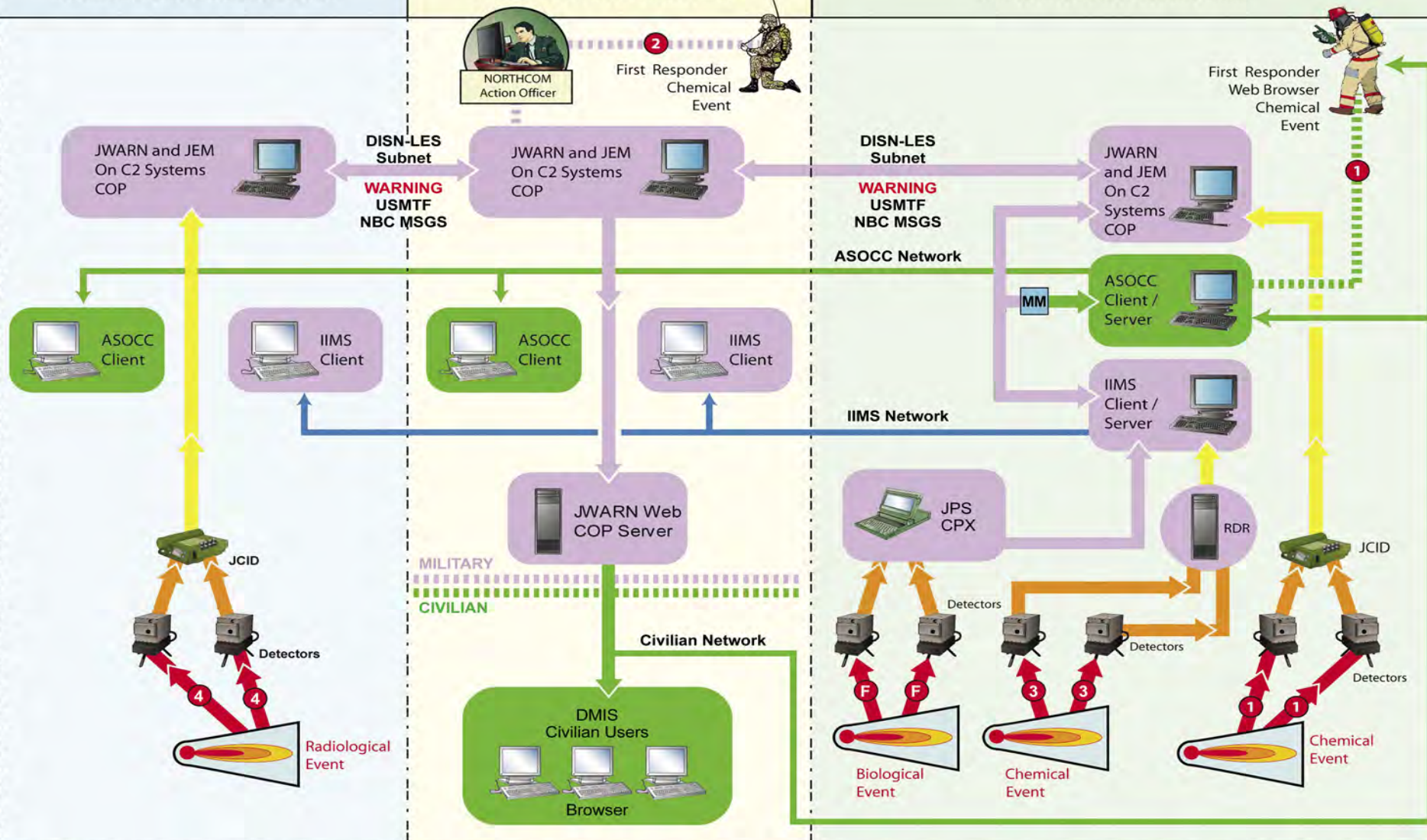
National Guard Bureau East



First Responder
Chemical Event



First Responder
Web Browser
Chemical Event

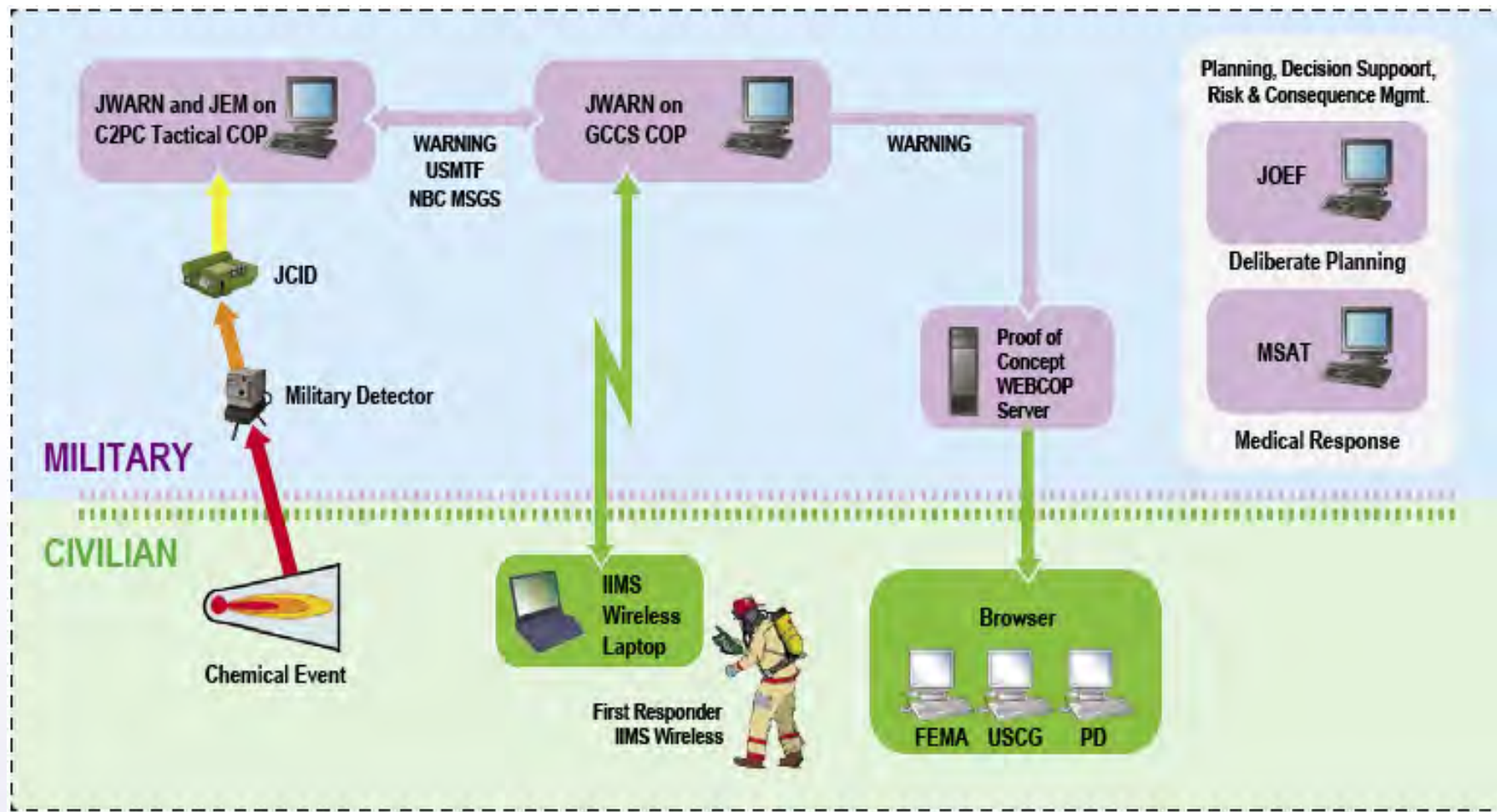


- 1 Chemical Event 1 Starts Here
- 2 Chemical Event 2 Starts Here
- 3 Chemical Event 3 Starts Here
- 4 Radiological Event 3 Starts Here
- F Biological Freeplay Event Starts Here

- Event Effect
- Detector Data
- JCID Data
- Military Network
- Civilian Network
- IIMS Network

- ASOCC – Area Security Operations Command and Control
- JEM – Joint Effects Model
- JWARN – Joint Warning And Reporting Network
- RDR – Remote Data Relay
- DMIS – Disaster Management Interoperability Services
- JCID – JWARN Component Interface Device
- JPS CPX – Joint Portal Shield Command Post
- IIMS – Integrated Information Management System
- COP – Common Operational Picture
- C2 – Command and Control
- MM – Message Mediator

CBIS 05 Architecture

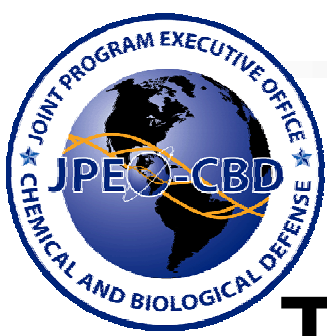




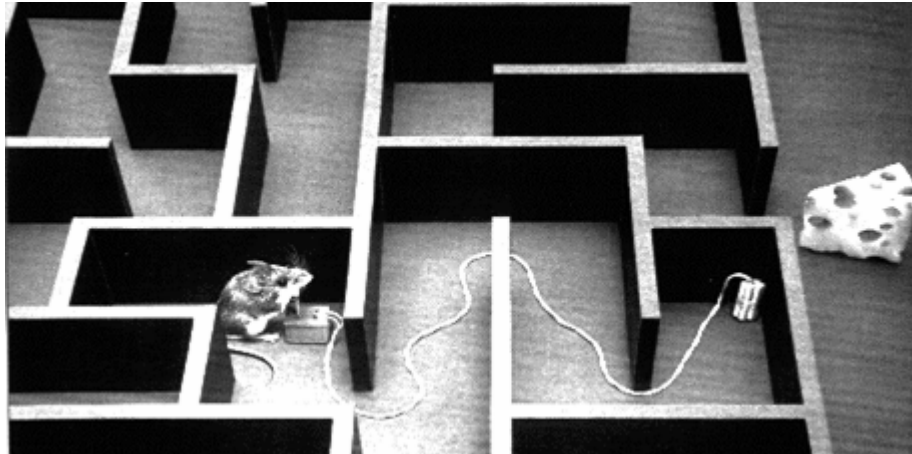
JWARN Summary

- **Connects CBRN sensors directly to, and resides on, Joint and Service Command and Control (C2) systems**
- **Provides both the physical substrate for sensor connectivity and allows connection to the C2 host**
- **Provides the means to configure, monitor and manage the sensor network**
- **JWARN is the accredited CBRN Warning and Reporting DoD Program of Record and provides a solid venue for S&T insertion strategy**





Technology Transition Overview



How do I get the Cheese?

October 25, 2005

PRESENTED TO:
Conference on Science & Technology
for Chem-Bio Information Systems
Albuquerque, NM
October 25, 2005

CURT WILHIDE
Chief, Advanced Technology
and Transition
703.681.1607
Curt.Wilhide@jpeocbd.osd.mil



“A hiatus exists between the inventor who knows what they could invent, if they only knew what was wanted, and the soldiers who knew, or ought to know, what they want and would ask for it if they only knew how much science could do for them. You have never really bridged that gap yet.”

***Winston Churchill
The Great War, Vol. 4***





Vision

Develop and Sustain a Comprehensive, Agile, and Flexible Transition Program that:

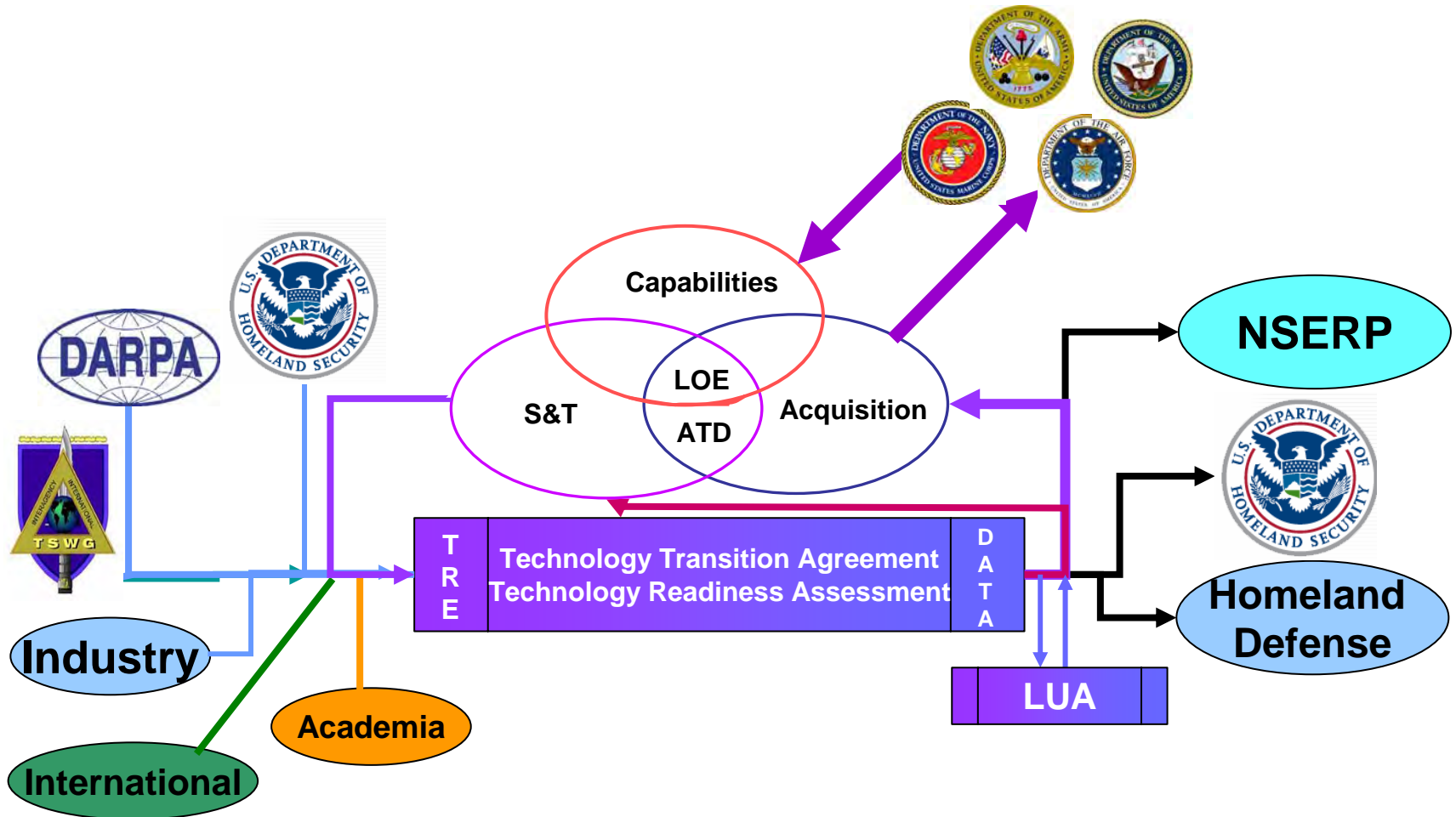
- **Improves integrated, modular, network-centric material response to CBDP Capability Needs**
- **Provides Multiple Program, Agency, Vendor Access**
- **Facilitates Multiple Acquisition/Procurement Opportunities**
- **Maximizes Opportunity For Best Capability at the Right Time**
- **Technology Transition Agreement Process**
 - **Transition Handbook – Jul 05**
 - **Technology Push**
 - **Technology Pull**



Transition Drivers

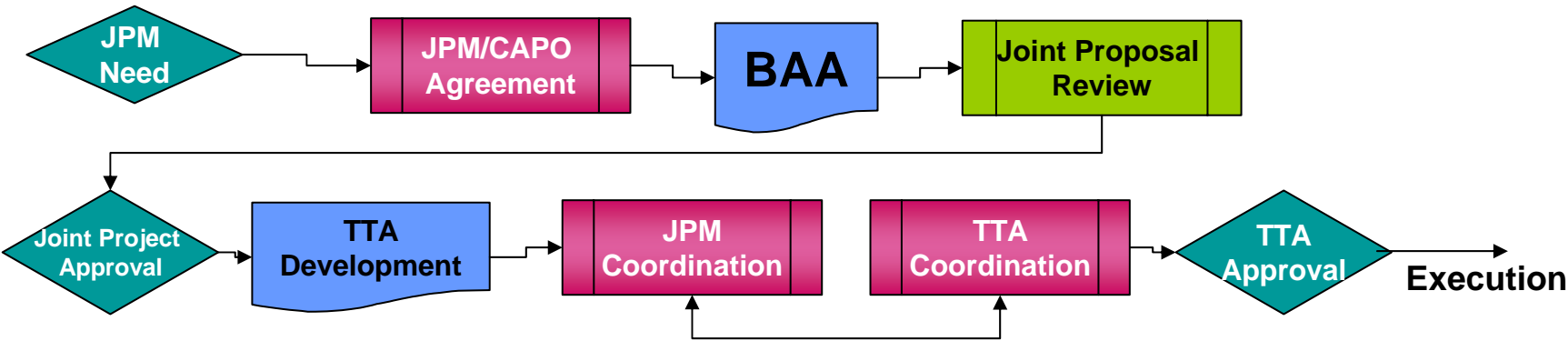
- **Shape Future Force Agility, Flexibility and Capability**
 - **Common Interfaces for Systems of Systems**
 - **Modular, Tailorable, and Networked**
 - **Broad Spectrum Capability to Complex CBRNE Environment**
- **Ensure Program Alignment**
 - **Technology Transition Agreement**
 - **S&T Exit Criteria**
 - **Rational POM Build**
- **Defined S&T Strategy**
 - **Traceability**
 - **Trade-Offs**

Integrated Transition Process

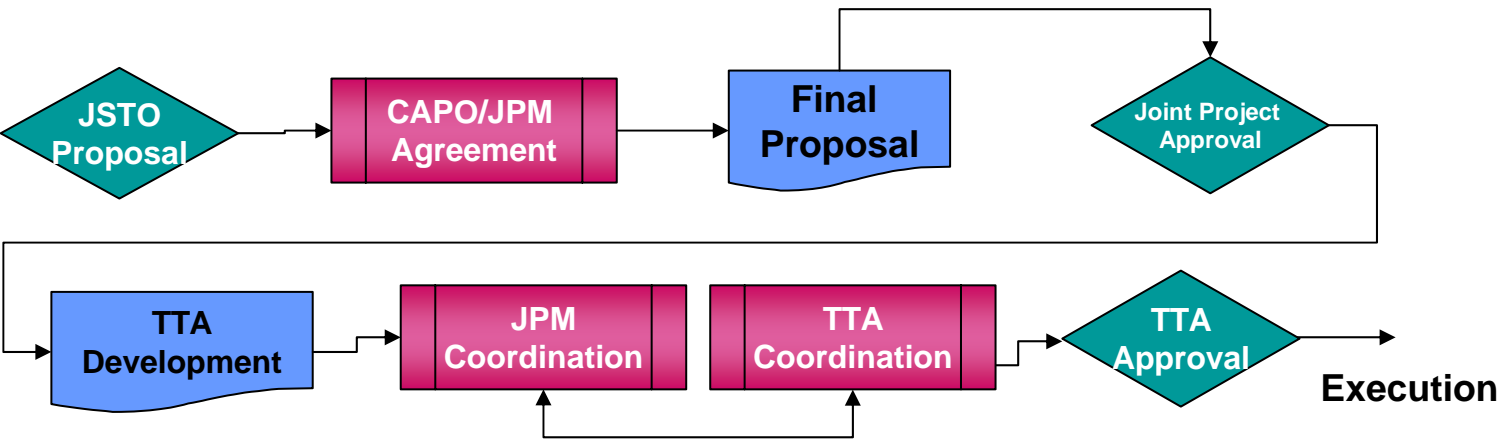


Sources for Capability Development

Technology Pull



Technology Push



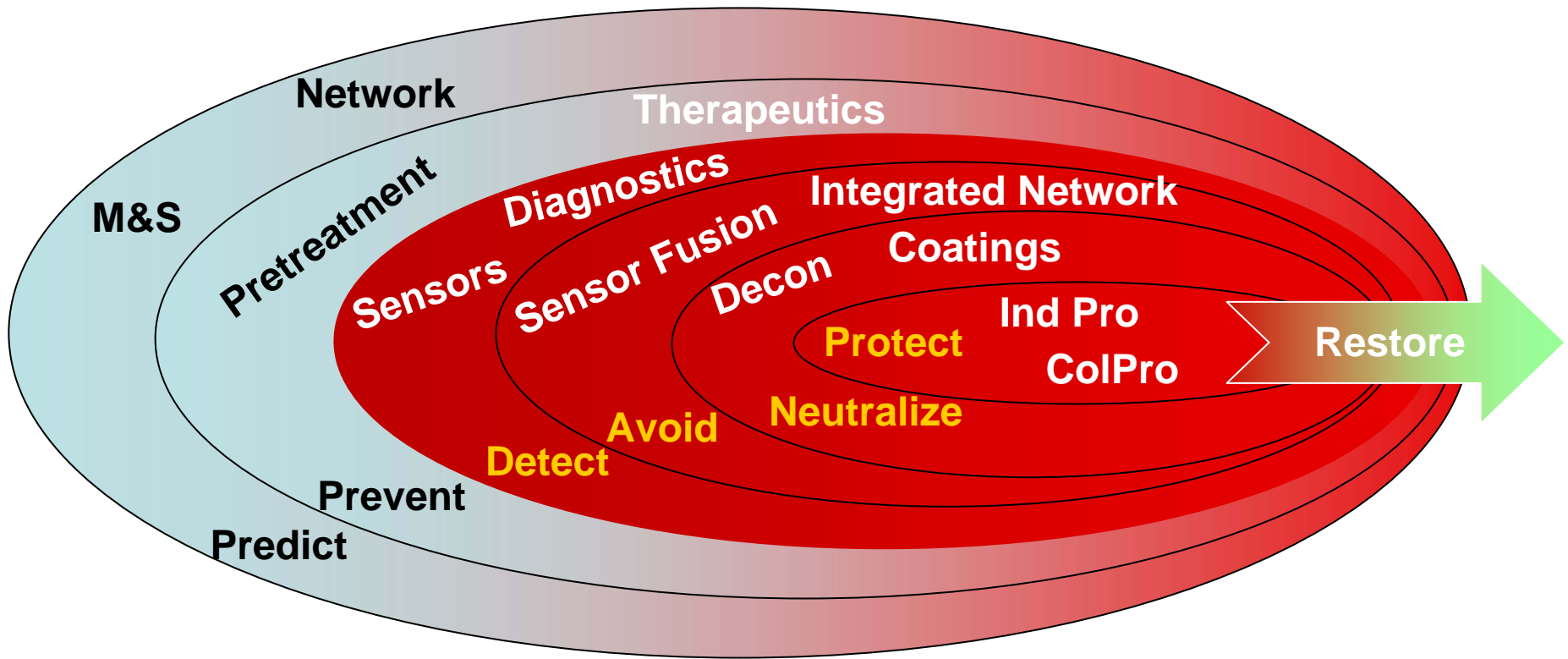


System Solutions to Mitigating the CB Threat

Pre-Exposure

Exposure

Post Exposure





Global Projection

Force Protection – Installation Protection

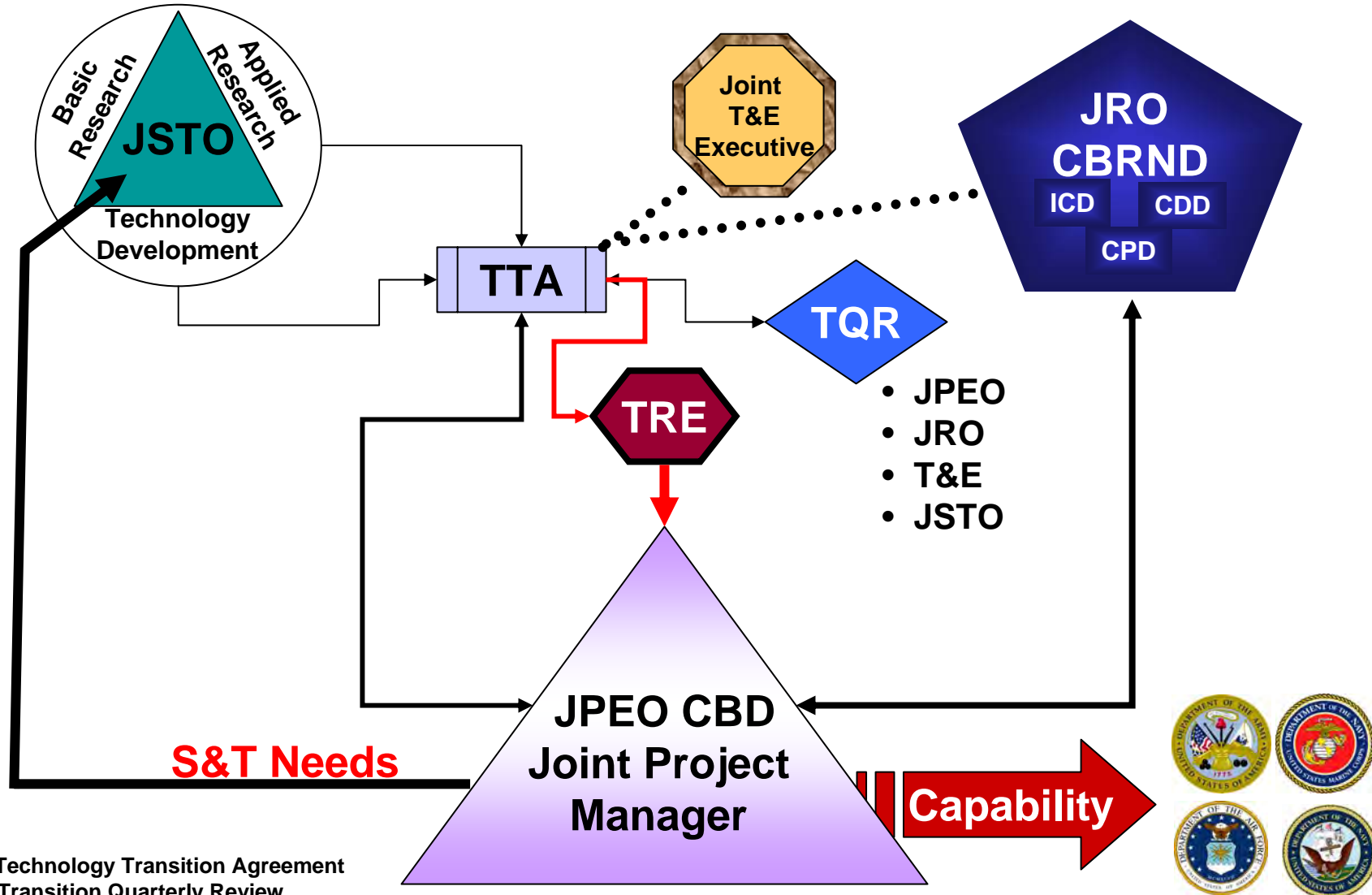


Technology Transition Agreement

- **Required for 6.3 Programs**
 - Identifies Target Program of Record
 - Concept of Use
 - Traceability
- **Technology Development Strategy**  **Acquisition Strategy**
- **Test and Evaluation Strategy**  **TEMP**
- **Contains Information Necessary to Conduct Technology Readiness Assessment (TRA)**
 - Exit Criteria (to Include defined Technology Readiness Levels)
 - Receiver Operator Characteristic (ROC) Curve/ Spider Chart (s)
 - Metrics
 - Attributes
- **Agreement Between the JPM and CAPO with Joint T&E Executive Concurrence**

TTAs for 6.3 Programs starting in FY06

Technology Development and Review



TTA: Technology Transition Agreement
 TQR: Transition Quarterly Review
 TRE: Technology Readiness Evaluation



Test and Evaluation Strategy

- **Supports TEMP Development**
- **Developed by the TTA Team**
 - CAPO
 - JPM
 - T&E
- **Coordinated with T&E Executive**
- **Identify Test Process and Infrastructure Impacts Early**
- **Supports Development of the Test and Evaluation Master Plan (TEMP)**



Technology Development Strategy

TDS Facilitates:

- **Acquisition Strategy**
 - **Rationale for Evolutionary/ Spiral or Single-Step**
- **S&T Management Strategy**
 - **Cost, Schedule, Performance Goals of S&T Program (Includes Exit Criteria)**
 - **Capability Metrics and Attributes**
- **Complete Description of Technology Demonstration or TRE**
 - **Test Plan**
- **Responsibility of JPM**
 - **Receiver Operating Characteristic Curve**
 - **Spider Chart**
 - **Technology Metrics and Attributes**
- **Captured in TTA for Most CBDP Efforts**

Tools

- Historically, Technologies Transition without Metrics and Attributes to conduct Trade-Off Analyses
- ROC Curves and Spider Charts Characterize the Trade Space:

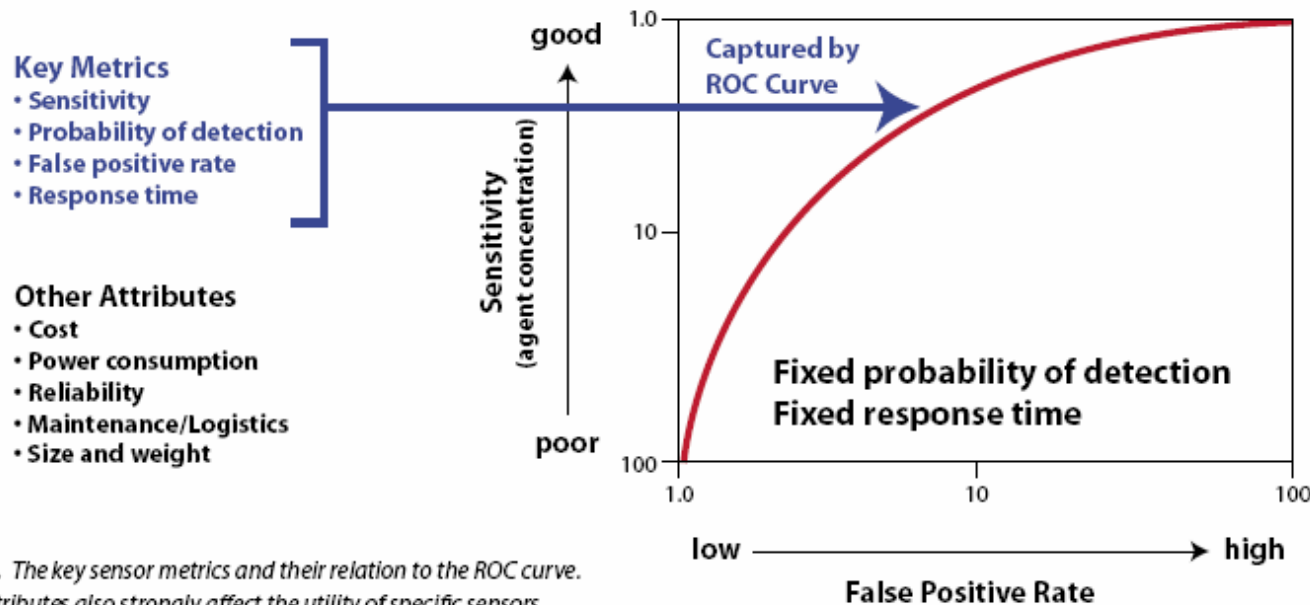
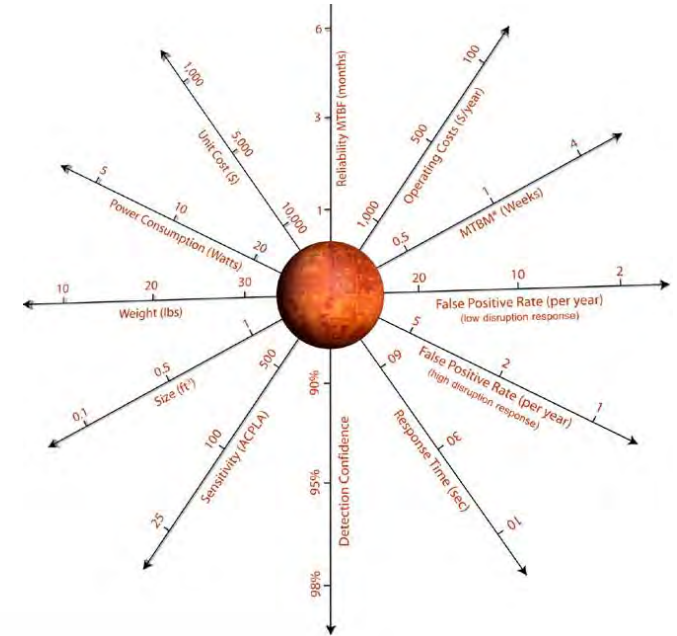


Figure A. The key sensor metrics and their relation to the ROC curve. Other attributes also strongly affect the utility of specific sensors.



Technology Readiness Evaluation

- **Does Not = Test at Dugway**
- **Data to Support Technology Readiness Assessment (TRA)**
 - **Paper Studies and/or Laboratory/ Field Tests**
- **Used to Determine Effectiveness and Suitability of a Technology to Meet Program Criteria as Defined in the TTA**
- **Conducted Prior to a Transition Event to Support a MS Decision, P³I, or Transition to Advanced Development**
- **Responsibility of JSTO ICW JPM**



Technology Readiness Assessment

- **Review of Specific Component or System Determined to Have Met Criteria in the TTA**
- **Conducted By Assessment Panel**
 - **Chaired by JSTO**
 - **JPM and Joint T&E Representation**
- **Conducted Prior to Transition to Advanced Development**
- **All Critical Technologies Assessed**
- **Responsibility of JSTO**



Technology Readiness Levels

Program Development Phase

Basic/Applied Research	Advanced Technology Development	Advanced Component Development	System Development and Demonstration	Production and Operational System Development
1-2-3-4	5-6	6-7	7-8	8-9
TRLs 1 – Basic Principles Observed 2 – Technology Concept Formulated 3 – Proof of Concept 4 – Laboratory Environment Component/Breadboard Demo 5 – Relevant Environment Component/Breadboard Demo			6 – Prototype Demo in Relevant Environment 7 – Prototype Demo in Operational Environment 8 – System Qualified through Test and Demo 9 – System Proven in Operation Conditions	

- JPM Defines and Assigns TRLs
- JSTO Responsible for TREs
- Overall System TRL Determined By Lowest TRL of Components and/or Subcomponents



Transition Quarterly Review

- **Organizations Represented:**
 - JSTO
 - JPEO-CBD
 - Joint T&E Executive
 - JRO-CBRND
- **Monitors Progress of Technology Transition**
 - Identify Candidate S&T Technology Areas/Programs for Future Transition and Plan for this Transition
 - Review Transition Testing Programs and Plans for Tests and Test Methodology Development
 - Report on Transition Tests and Results
 - Develop Future Year Program Transition Requirements
 - Review Status and Currency of TTAs



Bottom Line

- **CAPO and JPM Must Coordinate Effectively in Order to Complete Documentation and Processes Necessary to Meet CBDP Technology Transition Needs**
- **JPEO-CBD and DTRA-CBX will Assist/Facilitate this Process**
- **Transition Process Results in Best Available Capabilities to the Right Programs**

**Best Available Capability for the Warfighter
at the Right Price and the Right Time!**



The Reason for Our Success...



... Our People



